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ABSTRACT

Educational production can be studied by correlating levels of academic achievement with three independent variables: student's family background, student's mental ability, and school quality. To examine family background and school quality, information was gathered from schools in Argentina, Bolivia, Brazil, Colombia, Mexico, Paraguay, and Peru. Regression analyses of individual students by country, grade, and sex using reading comprehension and science scores reveal a strong correlation between family factors, such as parent educational background, and academic achievement, but do not show a strong correlation between academic achievement and school factors. Although the improtance of family factors decreases as a student moves to higher grade levels, school factors do not seem important at any stage in explaining academic achievement as long as minimal physical facilities are available. To better understand what factors most contribute to academic achievement, further research should deemphasize statistical analysis and focus on teacher-student interaction, formulating a taxonomy of teacher attributes and identifying those teachers who seem to produce higher levels of achievement in their students. Statistical findings by country are provided in 22 tables and 7 appendixes. (JBM)

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ACADEMIC ACHIEVEMENT, SCHOOL QUALITY AND FAMILY BACKGROUND

STUDY IN SEVEN LATIN AMERICAN COUNTRIES

by

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Paper presented at the 27th Annual Conference
of the
Comparative International Education Society

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ABSTRACT

Research on the determination of academic achievement is generally focused on the effects of family background variables and school variables. A common difficulty is the separability of these two groups of variables. Some research findings point out in this direction that school variables are particularly important in explaining variations in academic achievement among individuals. In this research, using the ECIEL school survey data for seven Latin American countries, family background appears to be an important influence regarding achievement, whereas almost no statistical significance is found for school variables. The main contribution of this paper is, in my opinion, methodological, regarding the handling of this type of data and the variables and forms of sampling design that should be considered in future research.

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I. INTRODUCTION

The central issue in this research is the explanation of variations in students' academic achievement as a function of school factors and family background. The methodological format adopted here correspondends to an education production function. This approach has been followed by a number of authors whose work will not be reviewed in this paper. I intend to examine a number of theoretical and methodological implications in applying this method to the available data.

The theory of production that we borrowed from microeconomic theory assumes that the different factors of production are combined or allocated in such a way that they produce a certain level of output by using the factors at maximum level of efficiency. This involves the existence of a mathematical function that can be estimated in principle. This production function basically defines a technical or engineering relationship between the amount of factors of production and the levels of output. It assumes that for a given point in time, the state of technological development determines a quantitative correspondence between factors and output. The production function has a number of properties involving the ratios between levels of output and the corresponding levels of employment of each factor, or in other words, average productivity for each factor.

Another property is the ratio between the increment in the level of output caused by an increment in the level of employment of one factor with the other factors kept constant, or the marginal productivities of each factor. Regarding marginal productivities it is important to keep in mind that production function theory establishes the possibility of the law of diminishing marginal returns that states that if a factor is increased

with the other factors kept constant, the level of output will increase at diminishing rates, perhaps to a point in which the marginal productivity is zero or even negative.

Another important property of production functions is the elasticity of substitution between pairs of factors. The elasticity of substitution measures how easily one factor can be substituted for another factor to keep the same level of production. In one extreme, if two factors of production must be used in fixed proportions due to the characteristics of the particular production process, possibilities of substitution are nil and the elasticity of substitution between them is zero. In the other extreme, if the production process is such that the contribution of one factor to the level of output does not have anyting to do with the contribution of another factor to output (in other words, if the production process has a linear component), then the elasticity of substitution is infinite, implying that there are no difficulties in the substitution of one factor for another to keep the same level of output, that is, the factors are perfect substitutes.

In applying these concepts to educational processes a number of considerations must be kept in mind. A most important one is the fact that the variables used in traditional production function theory and its empirical applications are cardinal variables, while in educational processes, variables such as academic achievement, school quality and student's family background are usually of an ordinal kind. This forces us to be very careful in interpreting the results of quantitative analysis involving that type of variable, especially regarding comparisons of certain coefficients and estimates of elasticities. It is also important to consider that the assumption of maximum efficiency use of production factors in traditional applications of production theory is closer to reality

than it is when we apply the same theoretical construct to educational processes.

Economic production functions are usually observed in enterprises that have the incentives to use factors of production with maximum efficiency. At the same time, the possibilities of observing levels of efficiency in the use of production factors are wider, given the fact that these production processes deal with more tangible components. It is not the same in studying educational processes. Even when there are reasons to believe that incentives exist in educational processes, particularly in private schools for using production factors with maximum efficiency, the sheer presence of a factor does not guarantee the production of a certain level of output, since the process variables tend to play a much more important role than they play in traditional economic activities. In fact, production processes in economic activities do involve technological relationships that are handled through engineering arrangements of the factors involved in the process. The quality of management of that type of process is always an important variable that will determine levels of productivity in the use of the factors involved, but in regard to education, managerial quality (including teacher's behavior in the classroom) can be assumed to be more critical.

The "engineering" relationship in educational processes is not at all established. What we are dealing with here is in fact a theory or lack of a theory of learning. In applying a production function approach to explain academic achievement in individuals, somehow we are assuming that the simple presence of the factors determines a certain level of output. Process variables ar usually ignored due to the fact that they are very difficult to observe in a systematic way.

These considerations do not invalidate the application of the production function approach in the study of educational processes, but they are important in interpreting the results of any empirical work. In spite of all the limitations, production function theory is helpful in analyzing a number of important issues regarding academic achievement in individuals. A crucial one is whether there are possibilities of substitution between family background and school quality. The role of family background in academic achievement or, in general, on the levels of success that a child might reach in school is very well established. Children of parents with low levels of education tend to do less well in school than children of better educated parents. One critical issue is whether the school system can make up for deficiencies in family background.

For educational production functions we can generally define levels of achievement as the dependent variable, while the factors of production or independent variables can be grouped into three basic categories: student's family background, student's mental ability and quality of the school. In this research, we do not have observations on student mental ability and this has implications that will be discussed later on. At this point, it is necessary to disclose in some detail the role that the two other factors or groups of factors are expected to play in producing levels of achievement.

The variables characterizing family background have traditionally been parental levels of education and occupation, family size, level of family income, and specific attributes of the household that are expected to influence a child's level of achievement, such as number of books at home, availability of newspapers and magazines, and other appropriate

environmental factors. All of these variables are in fact proxies for variables that might have a direct relationship with student achievement. For example, the level of education of the parents is assumed to create a propitious atmosphere at home for a child to acquire certain verbal skills and values that will help him in school. All these, of course, will play a role in terms of specific forms of behavior of the parents vis-a-vis the child. All these process variables are not usually observed, but have an important relationship with the child's mental abilities, and at the same time with the education that he or she receives at home. Parental occupation tends to be correlated with parental education, but it can also be used as a proxy for either levels of income of the family when this information is not available, or levels of aspirations regarding education. Family size is expected to have an impact on the children's education through the basic mechanism that causes parental attention to be divided among a number of children. Nevertheless, this ignores the possibility that parents might concentrate their attention more on some children than others as a result of preferences, perceptions about their abilities, or order in which the children are born. Household income is a measure of ability to pay for education, but information on actual expenditures on educational means is not usually available. Thus, on the side of family factors, we are basically dealing with proxy variables, which introduce a significant amount of errors of measurement and consequently will have an effect on the results of empirical work.

Variables representing school quality involve the same type of difficulty. A posteriori, we can identify a good school as one that produces students with high levels of achievement. But we know very well that this criterion involves the quality of the school per se, and the

quality of the student as well. It is important to point out that this form of quality is the one mostly perceived by the parents in deciding what school they should send their children to, provided that they have that option. But the question is whether we can separate the quality of the school from the quality of the children in order to examine possibilities of substitution between them. In trying to determine the quality of an individual school we usually observe the facilities of the school and the characteristics of the teaching staff. On the side of the school, we concentrate on taking inventory of such facilities as existence of libraries, laboratories, basic installations as blackboards, seats, audio-visual instruments, etc. We also observe general characteristics of the school in terms of grade of upkeep, cleanliness, etc. On the teachers' side, we usually concentrate on the most easily accessible factors, such as their level of education, years of experience, level of pedagogical training, socio-economic background.

But all these school factors are, at most, possible necessary conditions for the education of the children attending school, and they might only constitute proxies for actual educational inputs.

It must also be taken into account that, with respect to family background, a particular child is generally expected to be influenced by one family; consequently, any determination of academic achievement via family background is a stable relationship to a certain degree. This is not the case in studying the role of school factors. A child in the same school will have different teachers with varying characteristics throughout a number of years. As a consequence, the relationship between an individual child's level of academic achievement in one particular year correlated with his or her teacher in that particular year, can be expected

to yield weaker results the higher he advances on the educational scale. Besides, the child may have been in different schools, each of them having varying influences on his education.

Above all these considerations about isolating school quality effects, it must be pointed out that no process variables are usually captured. If we perceive the child's ability to learn as a function, at one point in time, of his acquired skills and also as a function of his motiviation to learn, we cannot expect that the simple contact between a child and certain educational inputs will determine achievement.

The learning process takes effort for any individual, and effort is dedicated when there are incentives to do so. In this regard, it is reasonable to expect that, one one hand, the family exercises an important influence on the child's motivation to achieve academically, but however intense this influence may be, it will interact with the child's motivation in the classroom. In this regard, the teacher plays a central function. The teacher can be expected to represent a sort of switching mechanism between the child and the school inputs that are supposed to provide the child with the means to learn.

The training of the teacher and other characteristics might be seen as necessary conditions for academic achievement, or even as bottlenecks in this process, but they are not sufficient conditions. The fact that we do not have enough information about what happens in the classroom between the child and the teacher is a major limitation in understanding the role of the school in the production of education.

Furthermore, even if we had the information on those process variables, the difficulties in separating actual school quality from perceived quality creates a number of problems that if ignored can

produce highly misleading interpretations of the results of empirical research.

If there is a phenomenon of perceived quality by the child's parents in such a way that the parents preselect what they believe to be good schools on the basis of their own perceptions of their child's abilities and potential for acheivement, any sample design that does not take this element into account is going to be contaminated by a high degree of association between family factors and school factors. If a family wants to send a child to a good school just because they know that particular school happens to be attended by good students, they will do so without really knowing the intrinsic or actual quality of the school. This preselection process or decision rule cannot be dealt with without a very effective control of the relevant variables at the level of sampling design. The fact is that given the enormous complexity of the educational processes and the large number of variables that are suspected to play a role in the production of academic achievement, spurious statistical associations that are produced by preselection have been a fundamental factor on the weaknesses of this type of research with regard to the power of policy implications.

II. THE DATA

The data base used in this research corresponds to the ECIEL Program school survey carried out in 1975 and 1976 in seven Latin American Countries.[1] The sample design varied from country to country according to the research interests of the corresponding institutions in charge of the survey in each country. The sets of questionnaires and instruments were exactly the same for six of the countries: Argentina,

Bolivia, Colombia, Mexico, Paraguay and Peru. There were marginal changes in the questionnaires applied in Brazil. The sampling unit was the school in each case, and within each of the schools selected in the sample, students, teachers, and principals were interviewed. Additional information on school characteristics was gathered. Four levels of formal education were particularly taken into account. Only students from first, fourth and sixth grades of primary education were interviewed, along with students from the last year of high school. In the case of Brazil, eighth-grade students were interviewed also. With the exception of first-grade students, each student was given a multiple-choice test for reading comprehension and another test for natural science. The tests were especially designed for each level of education. The design of the tests was carried out with the data bank produced for Chile by the international survey previously conducted by the International Evaluation Association. In the design of the tests, careful consideration was given to the official curricular design of each of the countries included in the survey. The purpose was to design the same test for all of the countries, taking into account the subject matter that could be defined as common to all of the countries included. On the basis of the item analysis conducted on the Chilean data base, it was decided that the test should be as easy as possible, given the fact that they resulted relatively difficult in the Chilean sample.

In addition to the achievement instruments, each student, including first graders, was given the questionnaire to gather information about family background. From fourth grade up, the students were responsible for filling out the questionnaires, but first graders were directly interviewed. The variables on family background included factors such as

family size, parental education and occupation, and general characteristics of the household, such as number of books at home, presence of dictionaries, etc. The student's questionnaire also included items such as educational aspirations, proxies for nutritional development, quality of eyesight, etc.

For each grade included in the sample in a given school, at least one teacher corresponding to that grade was interviewed. The teacher's questionnaire included variables such as teacher's level of education, specialization in pedagogy, parental background, and attitudes toward students. Then for each of the schools included in the sample there was one questionnaire addressed to the principal of the school and another questionnaire to gather information on the general characteristics of the school. This information included items such as size of the school, costs, number of teachers, existence of different facilities, such as laboratories, gymnasiums, and libraries.[2]

As mentioned earlier, the sampling design was stratified according to different criteria in each country. The Argentinian sample involves basically the metropolitan area of Buenos Aires with a small sample of rural schools. The Brazilian sample only involves the city of Brasilia and its metropolitan area. No rural schools were included in this sample. Bolivia has a very wide geographical coverage involving four departments -- La Paz, Oruro, Cochabamba, and Santa Cruz. In each department, rural schools, as well as urban, were included. The sample for Peru included only the departments of Lima and Puno, with samples of rural and urban schools in both cases. Paraguay offers the closest to a national coverage, including rural schools as well as urban and semi-urban schools. The Colombian sample is urban only and includes the following cities:

Bogota, Cali, Popayan, Bucaramanga and Armenia. The Mexican sample covers the metropolitan area of Mexico City plus a small sample of rural schools.

Besides the geographical criterion to stratify the sample, other variables for stratification were considered. The most important one was to identify strata of different socio-economic levels according to the neighborhood of the schools. It was also decided to include both public and private schools in the different strata. Argentina included a number of technical schools at the secondary level of education. After each stratum was defined, the schools were selected at random in each of them. Once each school was selected, the entire class for each of the predetermined grades was considered in the sample. For those schools in which there was more than one section for a particular grade, one of the sections was selected if no grouping of the students was made by the school following any criterion, such as relative levels of achievement. In some cases, where the researchers found certain preselection of students to divide into sections, a random sample of each section was taken. The interviewing of the students was carried out over a period of at least two days. It was decided that the two achievement tests would not be applied in the same day in order not to overburden the students.

Even though meticulous care of the organization of the field work was taken, the data must be analyzed keeping in mind the possibilities of measurement errors. Some variables were not reported by the interviewed students, teachers or principals. In several instances, this followed a particular pattern as in the case of first and fourth grade children who frequently were not able to report parental levels of education. Nevertheless, as preliminary tests show, the mean scores of

those children were not significantly different from children with parents of low levels of education, and they were assigned the correspondeing lowest level of education. This imputation was made in the programming stage but is not in the raw data. However, the procedure generally followed for missing information was to strike the affected observation entirely from the analysis. This produces a certain amount of attrition in the sample which reduces the degrees of freedom for any inference exercise. That reduction does not affect most of the analysis done for different sub-samples, but it does affect certain sub-samples in which the remaining degrees of freedom are extremely low.

In general, the data obtained for some variables can be considered reliable, depending on the variable in question. Some variables offer a certain amount of difficulties in measurement. A case in point is the measurement of achievement in both tests. In spite of the very careful design, both tests for each of the grades included in this survey turned out to be more difficult than desired. The tests were applied within a limit of time, constant for each student in both achievement tests, but the means of the scores for each sub-sample tend to be too low. Each test was a multiple choice instrument -- the one on reading comprehension having five multiple choice answers for each of the 40 items, and the science test having four possible answers for each of 40 items. The expected score for students with zero level of achievement should be eight points in the reading test and 10 points in the science test.[3]

These considerations imply that a strong noise component might be contaminating the measurements on achievement, which are our fundamental variables. If the scores do not move high enough in the scale to 40 points, the variance around low means will be more correlated with

unobserved random factors and consequently will weaken the correlations with other relevant variables observed.

Specific conditions during application of each test in each school can be expected to have varied in spite of the fact that very careful training of the interviewers was undertaken. Environmental or other circumstantial factors influencing the individual student at the moment of taking the test can be expected to have an impact on the results. In any case, a certain amount of valid information is assumed to have been captured by both achievement instruments, but any results of inference tests must be analyzed in light of these elements.

III. BASIC THEORETICAL CONSIDERATIONS

The family background variables traditionally used to explain variations in students' academic achievement are parental levels of schooling and occupation, and also family size. In the ECIEL, data occupation is measured by the application of an occupational status scale, the values of which run from one to eight, with value one corresponding to the highest occupational status. Levels of education are measured by the scale that runs from one to four. Value one corresponds to no schooling, two corresponds to elementary schooling, three to high school or equivalent, and four to university. As occupation for one individual is highly correlated with his or her level of education, in this research I only used father's occupation, since this variable captures educational effects of the parents. It must be taken into account that the level of education of the mother is also correlated with father's occupation. In preliminary tests, father's occupation tended to be more representative of family background that the other traditional variables. Another variable included in our analysis is family size measured by number of siblings of

the student. Some other family related variables are included and will be specified below. Our basic methodological problem is to select which variables are better representatives of school quality. Even though the term "school quality" is widely used in this type of investigation, there are no satisfactory definitions of such a concept. The ECIEL survey, in particular, has almost 500 variables, including 117 on the student and the rest about the school. Independent of the fact that a high level of correlation could exist between family characteristics and school characteristics, when working with such a large number of variables many of them could be expected to be correlated with achievement by chance. If there is preselection of schools by parents, a high degree of correlation will exist between family background variables and school characteristics. As a consequence, many school variables might turn out to be more highly correlated with levels of achievement than family background variables themselves. The problem of multicolinearity will be discussed later. At this point, we have to focus on the basic notion that inference tests will have to be carried out carefully in order not to neglect the sampling error and its consequences in the analysis of the results. It is very important to understand that as a consequence of the large number of school variables available, and the fact that we do not have any theoretical ground to include school variables in any model, arbitrary inclusions of those variables into regression analysis or other statistical techniques could produce highly misleading results. This is why it is advisable that any specification of a model to test school variables must be consistent for different sub-samples, especially in regard to the different countries included in the survey. This consideration prevents us from using programming techniques, such as step-wise regression, which leave the

inclusion of the "relevant" variables to the vagaries of sampling error. Different investigations show that when applying this technique to large numbers of variables, there is little or no consistency in the variables which come out with the highest levels of significance. The results usually invite the risky exercise of ad hoc theorization, and, at the same time, tend to produce policy implications that are not well-founded.

This lack of theoretical grounds to formulate hypotheses for inference testing constitutes a fundamental contradiction of the principles on which statistical testing of hypotheses are founded. What most researchers do in this field is to test innumerable variables and then run many regressions, presenting the ones which show the best goodness of fit while not reporting the bad results. In this paper, I cannot claim not having done so, but at the same time that opportunistic search has been conducted, trying to get a group of variables that can be considered universally consistent, regardless of the country. It is true that different countries can have different explanatory structures for the variations of academic achievement; however, it is not realistic to expect special theories to explain achievement when we do not even have a general theory in this regard. Nevertheless, country characteristics should become apparent in applying a general model if we have the right set of data in terms of very carefully measured variables. I do not believe this is the case of the ECIEL survey, since, in spite of the careful effort dedicated to the design of the achievement instruments, we do not possess accurate information as to how representative the instruments are in terms of the specific curricula for the different countries at the different levels of education. This consideration, by itself, does not allow us to make straightforward comparisons of estimates of regression coefficients

for specific variables among different countries. Furthermore, we must realize that the variables involved in this survey represent a sort of universal school, and if school inputs matter by themselves, it should come out in regression results. Nevertheless, we neither have information about specific forms of organization of schools in different countries, nor about educational styles. It is in this type of variable that national characteristics might be more easily found through statistical analysis.

All of this implies that international comparison will have to be limited to the structure of significance of the variables included in one particular model for the comparative exercise, carried out within a narrow, but more realistic, framework. At the same time, in this type of research it is important to realize that comparisons can be much more important in terms of the ability of our models to capture certain universal patterns of behaviour than to show differences. After all, differences between countries with this type of variable will be a result of innumerable factors, including sampling properties. In addition, the fact that the variables in the survey are usually ordinal in nature, comparisons between regression coefficients can also be meaningless according to the very nature of the information gathered through these variables. For example, even though the occupational scale was very well defined and applied in the seven ECIEL countries, this variable represents a proxy for a number of variables; however, the way this representation performs as an explanatory variable can be expected to vary from country to country, given the fact that one particular level of occupation might correspond to different levels of schooling from country to country, or different levels of income, or educational aspirations of children.

The variables I consider to be the most important, in regard to interaction between school quality and family background in the explanation of academic achievement, are tested by applying the following model:

$$\text{Achievement} = \alpha_0 X_1^{\alpha_1} X_2^{\alpha_2} \ldots\ldots X_i^{\alpha_i} \ldots\ldots X_n^{\alpha_n} u$$

where the X_i's are the explanatory variables and the exponents to the variables are the coefficients to be estimated. The stochastic term is represented by u. These coefficients are estimated, transforming the equation into a logarithmic form, making possible the application of linear regression analysis. In this case, the model becomes the following form:

$$\ln\text{Ach} = \ln\alpha_0 + \alpha_1 \ln X_1 + \ldots\ldots + \alpha_n \ln X_n + \ln u$$

Notice that the multiplicative specification of an achievement model implies that a value of zero for any individual independent variable determines a value of zero for the dependent variable. By the same token, a very low value in one of the variables could be, in principle, compensated for a relatively high value of any other independent variable; however, this would depend on their corresponding exponents. Exponents, themselves, represent elasticities with respect to achievement. This means that each coefficient measures the percentage points that achievement would be incremented with one percent of increment (positive or negative, depending on the coefficient sign) of the corresponding variable. As a result of all the considerations made above about comparisons of coefficients, our attention here will be limited to the statistical significance of those coefficients. Accepting the null

hypothesis for one particular coefficient implies that the exponent of that particular variable is zero; consequently, the variable does not have any effect on the dependent variable. A negative coefficient is also interpreted similarly with a linear model, since the multiplicative specification means that the variable with a negative exponent is going to be in the equation as a divisor.

Student's age, which is frequently introduced in models explaining achievement as another explanatory variable, has been excluded in this model. This variable is significantly and negatively correlated with achievement for each grade sub-sampled, and its inclusion in the model tends to increase the model's goodness of fit measured by the R-square. Nevertheless, this is an artificial way of improving the explanatory power of the model, since the variations of age for a given grade can be construed as another measurement of achievement. In other words, variations in student age for each grade is a variable which better corresponds on the left hand side of these types of models. By itself, it tends to be correlated with family background and sometimes with certain school variables. And, its inclusion as an explanatory variable would subtract significantly from those variables in terms of explaining achievement scores.

The model specified above is applied for each sex, each grade, and each country. The results will be discussed in the following section. There are several reasons for running separate regressions per county. Expected range of variations of these variables can vary from country to country due to the countries' characteristics, as well as to sampling design. At the same time, it is realistic to assume that the structure of significance, or level of the estimated coefficient, might vary among

countries, in spite of the fact that, as discussed earlier, country comparisons of coefficients do not make too much sense. A similar consideration can be made to justify the application of the model by sexes. In this particular case, intersex comparisons of coefficients can make more sense given the constancy of interpretation of the range of values of the different variables within one country.

The partition of the sample by grade provides us with the possibility of showing that the structure of significance among the selected explanatory variables varies among grades. In general, it can be expected that family background is more important in explaining achievement during the first years of the educational process; consequently family background will tend to be weaker in the last years of high school. At the same time, school variables should increase in explanatory power and the higher we move in the educational scale. This phenomenon results from the fact that for each grade, the dropout tends to be from less educationally privileged families. The structure of representation of socio-economic background for each grade is shown in Tables 1 and 2. Table 1 shows the education of the students' mothers sampled for each grade in each of the seven countries. As explained before, the mother's education was originally measured on a scale from one to four, with one representing no education and four representing higher education. To facilitiate summarization of these results for all of the countries, means were calculated for these variables in each sub-sample. The standard derivation and number of cases in each cell are shown below the means. Observe how the means tend to increase with grade and sex group in each country. The trend shows the same pattern in almost every case, except for boys in the Brasilia sample.

Table 2 indicates the variable father's occupation. This variable was measured on a scale of one to eight, with one representing the highest occupation level and eight the level of unskilled worker. In this table, the trend of the means throughout grades is consistent with the trend of the means, as shown in Table 1. Once again, the Brasilia sample constitutes the exception, and, in this case, it also affects the group of girls. These tables indirectly show the process of dropping out, since the proportion of children of low socio-economic status decreases as grade level increases. It can be seen that the increments of the means between levels vary according to country and sex. These results should be taken as a signal that any analysis of the role of socio-economic variables on achievement will have to vary in procedure from sample to sample, since the representativeness of socio-economic status for each grade will vary according to whether there is automatic promotion or if the standards for promotion are different between countries.

Table 3 is presented to reinforce the notion of variations in sample compositions. The table reflects the wide variations in enrollment rates country by country, especially for secondary education. It is interesting to note that the enrollment grades for Brazil for secondary education is 99%, which is the highest rate among all the countries. This might shed some light on the puzzling result for Brasilia appearing in Tables 1 and 2. If, effectively, Brazil enjoys such high enrollment rates (and if they were the same for Brasilia), the socio-economic composition for different grades should not change significantly as it appears in these particular tables. In any case, the figures in Table 3 must be analyzed by taking into consideration that they only represent enrollment rates, not actual measurements of school attendance. The enrollment statistics are

TABLE I

MOTHER'S EDUCATION

Grades	Boys 1	4	6	8	12	Girls 1	4	6	8	12
ARGENTINA										
Means	1.626	1.958	2.241	N.A.	2.355	1.778	2.009	2.253	N.A.	2.621
Std. Dev.	0.809	.912	0.811	N.A.	0.600	0.909	0.959	0.801	N.A.	0.669
N	235	426	431	N.A.	324	185	455	474	N.A.	219
BRASILIA										
Means	N.A.	1.809	1.885	1.659	1.711	N.A.	2.095	1.954	1.982	1.571
Std. Dev.	N.A.	0.885	0.879	0.699	0.625	N.A.	1.109	1.005	0.945	0.620
N	N.A.	272	192	138	197	N.A.	253	260	275	275
BOLIVIA										
Means	1.626	1.778	2.083	N.A.	2.448	1.778	2.058	2.362	N.A.	2.562
Std. Dev.	0.809	1.038	1.031	N.A.	0.825	0.909	1.159	1.099	N.A.	0.803
N	235	284	313	N.A.	232	185	206	257	N.A.	162
COLOMBIA										
Means	1.751	1.958	1.966	N.A.	2.286	1.732	2.164	2.105	N.A.	2.562
Std. Dev.	0.858	0.912	0.789	N.A.	0.596	0.867	1.124	0.917	N.A.	0.803
N	289	426	615	N.A.	42	340	591	679	N.A.	162
MEXICO										
Means	1.624	2.140	2.265	N.A.	2.578	1.629	2.164	2.178	N.A.	2.791
Std. Dev.	0.986	1.181	1.003	N.A.	0.980	0.938	1.124	0.913	N.A.	0.823
N	218	541	573	N.A.	180	264	591	650	N.A.	177
PARAGUAY										
Means	1.628	2.348	2.516	N.A.	2.559	1.688	2.299	2.478	N.A.	2.553
Std. Dev.	0.825	1.164	1.053	N.A.	0.773	0.767	1.100	0.954	N.A.	0.721
N	266	503	581	N.A.	458	349	575	510	N.A.	405
PERU										
Means	1.459	1.754	1.998	N.A.	2.297	1.491	1.829	2.113	N.A.	2.480
Std. Dev.	0.743	0.900	0.938	N.A.	0.773	0.745	0.976	0.912	N.A.	0.763
N	357	414	407	N.A.	202	316	339	302	N.A.	248

TABLE 2

FATHER'S EDUCATION

Grades	Boys 1	4	6	8	12	Girls 1	4	6	8	12
ARGENTINA										
Means	5.580	5.108	4.902	N.A.	4.236	5.223	5.016	4.957	N.A.	3.509
Std. Dev.	1.459	1.506	1.584	N.A.	1.494	1.645	1.455	1.590	N.A.	1.335
N	224	407	420	N.A.	322	176	434	468	N.A.	214
BRASILIA										
Means	N.A.	2.579	2.555	2.717	2.495	N.A.	2.424	2.482	2.467	2.427
Std. Dev.	N.A.	0.551	0.539	0.483	0.541	N.A.	0.624	0.553	0.625	0.565
N	N.A.	271	191	138	196	N.A.	250	257	272	274
BOLIVIA										
Means	5.580	5.484	5.140	N.A.	4.282	5.233	4.834	4.399	N.A.	3.766
Std. Dev.	1.459	1.573	1.663	N.A.	1.742	1.645	1.840	1.852	N.A.	1.563
N	224	287	314	N.A.	227	176	205	253	N.A.	154
COLOMBIA										
Means	5.148	5.108	5.142	N.A.	4.674	4.763	4.855	4.722	N.A.	2.087
Std. Dev.	1.493	1.506	1.414	N.A.	1.410	1.653	1.840	1.587	N.A.	0.535
N	277	407	625	N.A.	43	321	633	644	N.A.	69
MEXICO										
Means	5.064	4.871	4.851	N.A.	3.567	4.992	4.855	4.808	N.A.	3.320
Std. Dev.	1.756	1.727	1.789	N.A.	1.762	1.815	1.840	1.832	N.A.	1.829
N	204	575	564	N.A.	178	239	633	652	N.A.	175
PARAGUAY										
Means	5.246	4.352	4.128	N.A.	3.870	5.198	4.427	4.200	N.A.	3.783
Std. Dev.	1.335	1.724	1.720	N.A.	1.584	1.356	1.636	1.620	N.A.	1.571
N	244	497	571	N.A.	440	313	553	496	N.A.	391
PERU										
Means	5.473	5.357	4.904	N.A.	4.105	5.408	4.985	4.864	N.A.	4.126
Std. Dev.	1.315	1.245	1.458	N.A.	1.508	1.282	1.507	1.483	N.A.	1.542
N	351	412	407	N.A.	200	311	335	301	N.A.	247

TABLE 3

SCHOOL ENROLLMENT BY LEVEL, 1967

Country	Primary	Secondary	Higher
Argentina	97.2 (a)	41.1	14.3
Bolivia	66.4	25.0 (b)	4.7 (c)
Brazil	64.4	99.1 (c)	2.8
Colombia	60.2	27.7 (c)	3.3 (c)
Mexico	83.8	23.9	4.1
Paraguay	82.5	19.3 (b)	2.8
Peru	92.5	41.2	8.3

(a) Provisional

(b) ECLA estimates

(c) 1966

Source: Statistical Bulletin for Latin America, Vol. III No. 1-2, June 1970, United Nations, New York, 1970.

relatively easier to collect since they represent records at the beginning of each school year. Consequently, they should be taken as maximum estimates of effective school attendance by the corresponding age groups.

Very little is known about the relationship between achievement and dropout rates. If achievement predicts the decision to drop out of school, (or if low expectations by the students or their parents as to the student's ability to stay in school produces low achievement) the attrition of each grade sub-sample, due to dropping out, will result in a changing explanatory structure for variations in achievement as we move up in the educational spectrum. In general, an achievement function should be basically related to two groups of student variables: mental ability and motivation to study. These two factors can be expected to be influenced by family factors as well as by school factors, although in different ways. School factors supposedly have a stronger effect on the motivational side. In any case, the ECIEL data, as well as most of the data available for this type of research, do not contain measurements of these variables. This has an important implication on the results of regression analysis which do not include observations on mental ability and motivation.

If ability is an important explanatory variable, and if it can be assumed to be positively correlated with family background, its exclusion from any model will tend to bias upward the estimates on family background.[4] These conditions will tend to show a higher than actual importance of family background in the lower grades; while in the upper grades (as a result of the fact that children from low socio-economic background tend to drop out of school at the early stages), with the possible exception of the ablest students, the effects from the student's side will less likely be as significant. However, the implications with

respect to omitted variables become much more complex if we include, in the same type of analysis, variables such as motivation to study or to stay in school.[5] Besides the omission of these variables, the fact that they might also be correlated with school factors through a preselection process will make the analysis of the results, without the most relevant variables, much more erratic. We do not know how strong the preselection process is in different countries or different regions in one country, or different types of schools. It can be expected that preselection affects private schools more than public schools. On the other hand, if public schools tend to be homogeneous in terms of physical characteristics, preselection by perceived school quality will be present more frequently in the family's decision regarding private and public schools. With all these caveats in mind, we can proceed in examining the results of the regression analyses.

IV. THE EMPIRICAL ANALYSIS

The model proposed in the previous section includes the following variables:

	Variable Code	Description
Dependent Variables	116	Reading test score
	117	Science test score
Independent Variables	036	How many brothers and sisters
	047	Father's occupation
	051	Number of books in household
	071	How often you had to go home due to lack of teacher
	178	How old is school main building
	228	Expenditure per student for labor
	260	Mean income of neighborhood
	387	Teachers' education
	405	Years of teacher's experience
	413	How many hours teachers work per week
	434	Level of satisfaction of teacher in his profession

The unit of observation is the individual student. Two regressions are estimated for each sub-sample by country, grade and sex. The first regression is run using reading comprehension scores as the dependent variable; the second regression uses science scores as the dependent variable. The results of these regressions are presented in Tables 4 through 17. The numbers between the parentheses represent t-values. The asteriks indicate significance at the 10% level or better in one-tail tests for t values and 5% or better for F values. Before discussing the tables for each country, let us examine Table 18 which summarizes the results of the previous tables. The figures in Table 18 indicate the number of times the corresponding variable appears significant for each grade, regardless of sex or country. The numbers in the parentheses indicate the proportion against the total number of tests. For each grade, each variable was tested 28 times as a result of the two achievement tests run for each of the seven countries and for both sexes separately. Fourth grade is not available for Colombia, and consequently, the total number of tests for fourth grade is 24. Variable 228 was not tested for Peru due to lack of variance; consequently, that variable was tested only 24 times, and for fourth grade, that variable was tested only 20 times.

The results provide strong evidence of the importance of family factors, as shown in the first four variables in the table. As expected the frequency with which those variables appear significant in the tests decreases as the educational level increases. Variable 178 measures the age of the main school building and was introduced in the regressions as a proxy for the prestige of the institution. Inclusion of this variable as a proxy of prestige is rationalized by the possibility that a strong preselection process exists with respect to parents who might choose those schools which they perceive as better quality. It is interesting to

TABLE 4

ARGENTINA
(READING)

	4th Grade		6th Grade		12th Grade	
	M	F	M	F	M	F
036	-0.056 (-0.95)	-0.071 (-1.11)	-0.068 (-1.10)	-0.023 (-0.49)	-0.058 (-0.60)	-0.204* (-1.94)
047	-0.281* (-2.34)	-0.080 (-0.06)	-0.058 (-0.50)	-0.176* (-1.89)	-0.128 (-0.85)	-0.118 (-0.59)
051	0.203* (2.18)	0.213* (2.20)	-0.090 (-0.75)	0.245* (2.29)	0.205 (0.44)	0.303 (0.80)
071	0.143* (1.49)	0.108 (-.79)	-0.161 (-1.29)	-0.003 (-0.03)	0.138 (0.70)	-0.138 (-0.58)
178	0.068 (1.21)	0.039 (0.06)	0.047 (1.00)	0.024 (0.59)	0.051 (0.24)	0.212* (1.30)
228	0.008 (0.10)	-0.181 (-1.97)	-0.211 (-2.48)	0.018 (0.29)	-0.253 (-1.63)	0.036 (0.28)
260	-0.222 (-1.06)	-0.244 (01.15)	-0.285 (1.22)	-0.210 (-1.03)	0.740 (1.02)	0.251 (0.37)
387	-0.930 (-2.51)	0.304 (0.81)	-0.155 (-0.52)	0.480* (1.95)	1.123* (2.51)	...
405	0.012 (0.24)	0.046 (0.72)	0.124* (2.48)	-0.034 (-0.79)	...	...
413	-0.173 (-1.09)	-0.296 (-1.22)	0.441* (2.40)	0.025 (0.16)	...	...
434	-0.027 (-0.25)	-0.128* (-1.42)	0.107 (1.16)	-0.112* (-1.32)	0.357 (0.82)	-0.235 (-0.48)
R^2	0.14	0.08	0.10	0.09	0.23	0.23
F	3.45*	2.36*	2.51*	2.49*	2.07*	2.05*
N	163	163	154	169	34	29

* Represents 10% significance or better for t values, and 5% significance or better for F values.

TABLE 5

ARGENTINA
(SCIENCE)

Independent Variables	4th Grade M	4th Grade F	6th Grade M	6th Grade F	12th Grade M	12th Grade F
036	-0.105* (-2.02)	-0.022 (-0.39)	0.039 (0.72)	-0.051 (-1.27)	0.018 (0.22)	-0.004 (-0.05)
047	-0.114 (-1.09)	0.094 (0.75)	-0.151* (-1.50)	-0.101 (-1.26)	0.275 (2.12)	-0.046 (-0.31)
051	0.092 (1.12)	0.191* (2.20)	0.038 (0.37)	0.097 (1.05)	1.604* (3.94)	0.580* (2.07)
071	0.116* (1.36)	0.274* (2.25)	-0.048 (-0.44)	0.156* (2.00)	-0.292 (-1.70)	-0.457 (-2.60)
178	0.024 (0.49)	0.027 (0.45)	0.010 (0.24)	0.118* (3.37)	0.437* (2.41)	0.307* (2.55)
228	-0.036 (-0.51)	-0.030 (-0.37)	-0.095 (-1.28)	0.027 (0.52)	-0.308 (-2.30)	-0.032 (-0.36)
260	-0.073 (-0.39)	-0.293* (-1.55)	-0.265* (-1.31)	-0.263* (-1.51)	1.538 (2.46)	0.576 (1.14)
387	-0.537 (-1.64)	0.123 (0.37)	-0.144 (-0.56)	-0.008 (-0.38)	0.486 (1.26)	...
405	0.081* (1.88)	0.028 (0.49)	-0.044 (-1.00)	0.044 (1.19)	...	...
413	-0.015 (-0.11)	-0.071 (-0.33)	0.284* (1.77)	-0.090 (-0.66)	...	...
434	-0.026 (-0.28)	-0.077 (-0.70)	-0.020 (-0.25)	0.002 (0.03)	0.576 (1.53)	0.222 (0.61)
R^2	0.10	0.06	0.02	0.14	0.34	0.31
F	2.55*	2.00*	1.23	3.52*	2.93*	2.57*
N	163	163	154	169	34	29

*Represents 10% significance or better for t values, and 5% significance or better for F values.

TABLE 6

BOLIVIA
(READING)

Independent Variables	4th Grade M	4th Grade F	6th Grade M	6th Grade F	12th Grade M	12th Grade F
036	0.099 (1.65)	-0.080 (-0.74)	-0.200* (-2.15)	-0.100 (-0.74)	-0.100* (-1.92)	-0.130* (-1.51)
047	-0.206* (-2.10)	-0.254* (-1.67)	-0.244* (-1.28)	-0.421* (-1.99)	-0.102* (-1.32)	-0.053 (0.39)
051	-0.141 (-1.37)	0.113 (0.59)	-0.085 (0.60)	-0.096 (-0.39)	-0.217 (1.57)	-0.190 (-0.85)
071	0.260* (2.89)	0.215 (1.17)	0.015 (0.96)	0.204 (0.79)	-0.069 (-0.56)	0.049 (0.28)
178	-0.109 (-2.87)	0.167* (1.92)	-0.034 (-0.62)	0.083 (1.19)	-0.025 (-0.57)	0.170* (2.74)
228	-0.017 (-0.29)	0.276 (0.86)	0.058 (0.44)	1.283* (2.91)	-0.219 (-0.87)	0.876* (2.18)
260	-0.073 (-0.46)	-1.657 (-0.93)	0.007 (0.01)	-4.870* (-2.76)	-0.211 (-0.46)	...
387	-0.101 (-0.36)	0.418 (0.38)	0.717 (0.78)	-10.074 (-3.32)	0.464 (0.99)	-1.064 (-1.61)
405	0.287* (3.50)	0.623 (1.29)	-0.075 (-0.77)	-0.229 (-1.88)	-0.016 (-0.15)	0.315* (1.66)
413	0.530* (1.66)	0.180 (0.34)	0.026 (0.09)	-2.989 (-3.28)	0.015 (0.14)	0.080 (0.61)
434	-0.057 (-0.55)	0.480 (0.59)	-0.253 (-0.70)	3.770 (3.05)	0.330 (1.92)	-0.392* (-1.51)
R^2	0.32	0.11	0.10	0.36	0.20	0.31
F	6.68*	1.60	2.07*	3.65*	3.82*	3.40*
N	134	53	109	52	129	55

* Represents 10% significance or better for t values, and 5% significance or better for F values.

TABLE 7

BOLIVIA
(SCIENCE)

Independent Variables	4th Grade M	4th Grade F	6th Grade M	6th Grade F	12th Grade M	12th Grade F
036	0.103 (1.45)	0.058 (0.66)	-0.062 (-0.87)	0.302 (2.77)	-0.019 (-0.29)	0.008 (0.07)
047	-0.240* (-2.14)	-0.105 (-0.85)	-0.114 (-0.78)	-0.182 (-1.05)	0.031 (0.31)	0.059 (0.34)
051	-0.115 (-0.98)	0.408* (2.63)	0.137 (1.26)	-0.410 (-2.04)	0.115 (0.65)	-0.485 (-1.73)
071	0.192* (1.86)	0.423* (2.82)	0.039 (0.33)	-0.308 (-1.47)	0.003 (0.19)	0.131 (0.59)
178	-0.076 (-1.77)	-0.044 (-0.62)	0.071* (1.69)	0.137* (2.40)	0.032 (0.57)	0.124* (1.59)
228	-0.100 (-1.49)	-0.248 (-0.95)	0.003 (0.03)	0.479* (1.34)	0.285 (0.88)	0.999* (1.99)
260	-0.215 (-1.18)	1.886 (1.30)	-0.468 (-1.30)	-2.359* (-1.65)	-0.387 (-0.65)	...
387	-0.011 (-0.03)	-1.453 (-1.64)	-0.463 (-0.66)	-2.603 (-1.05)	-0.133 (-0.22)	-1.740 (-2.11)
405	0.201* (2.14)	0.035 (0.89)	0.070 (0.95)	-0.068 (-0.69)	0.113 (0.84)	0.594* (2.51)
413	0.487* (1.34)	0.910* (2.11)	-0.072 (-0.33)	-0.836 (-0.94)	0.223* (1.58)	-0.185 (-1.13)
434	-0.065 (-0.55)	-0.608 (-0.93)	0.121 (0.44)	1.101 (1.10)	0.222 (1.01)	-0.099 (-0.30)
R^2	0.27	0.37	0.05	0.31	0.09	0.14
F	5.50*	3.73*	1.53	3.12*	2.16*	1.86
N	134	53	109	52	129	55

* Represents 10% significance or better for t values, and 5% significance or better for F values.

TABLE 8

BRAZIL
(READING)

Independent Variables	4th Grade M	4th Grade F	6th Grade M	6th Grade F	12th Grade M	12th Grade F
036	-0.016 (-0.41)	-0.044 (-0.96)	-0.019 (-0.29)	-0.037 (-0.86)	0.071 (0.90)	-0.072 (-1.06)
047	-0.219* (-2.96)	-0.169* (-1.34)	-0.138 (-0.96)	-0.172* (-2.21)	-0.463* (-2.18)	0.062 (0.41)
051	0.144* (1.52)	0.002 (0.02)	0.192 (1.02)	0.087 (0.94)	-0.216 (-0.42)	-0.548 (-1.04)
071	-0.108 (-1.01)	-0.056 (-0.49)	0.074 (0.48)	-0.018 (-0.15)	-0.059 (-0.32)	-0.061 (-0.34)
178	0.022 (0.56)	0.052 (1.06)	-0.105 (1.50)	-0.030 (-0.62)	-0.200 (-0.60)	-0.35 (-2.26)
228	-0.024 (-0.04)	0.126 (1.52)	0.041 (0.58)	-0.028 -0.64	0.173 (1.01)	0.228* (1.75)
260	-0.022 (-0.13)	-0.262* (-1.32)	-0.077 (-0.48)	0.227 (2.34)	...	...
387	0.839* (3.13)	-0.281 (-0.86)	0.222 (0.69)	0.103 (0.64)	-2.734 (-0.77)	-0.214 (-0.16)
405	0.014 (0.28)	0.107* (1.98)	0.034 (0.52)	0.002 (0.05)	-1.421 (-1.32)	0.070 (0.41)
413	0.224* (1.84)	-0.001 (-0.01)	0.155 (0.89)	-0.058 (-0.67)	-0.274 (-0.77)	-0.056 (-0.55)
434	0.029 (0.30)	-0.042 (-0.38)	0.064 (0.47)	-0.011 (-0.15)	0.553 (0.68)	0.037 (0.20)
R^2	0.15	0.02	0.04	0.06	0.38	0.15
F	3.94*	1.26	1.28	1.75	2.82*	1.90
N	187	155	76	126	31	52

* Represents 10% significance or better for t values, and 5% significance or better for F values.

TABLE 9

BRAZIL
(SCIENCE)

Independent Variables	4th Grade M	4th Grade F	6th Grade M	6th Grade F	12th Grade M	12th Grade F
036	0.016 (0.39)	-0.012 (-0.30)	-0.028 (-0.36)	-0.060* (-1.46)	0.136 (2.06)	-0.148* (-2.18)
047	-0.186* (-2.35)	-0.024 (-0.22)	-0.051 (-0.30)	-0.129* (-1.74)	-0.272* (-1.54)	-0.027 (-0.40)
051	0.231* (2.29)	0.069 (0.81)	-0.130 (-0.59)	0.105 (1.18)	0.757* (1.74)	1.026* (2.22)
071	-0.144 (-1.26)	0.043 (0.44)	0.016 (0.09)	-0.259 (-2.29)	0.015 (0.10)	-0.170 (-1.08)
178	-0.069 (-1.68)	-0.010 (-0.23)	0.156* (1.88)	0.021 (0.46)	-0.055 (-0.20)	-0.422 (-1.98)
228	-0.111 (-1.73)	-0.0003 (-0.004)	0.046 (0.55)	-0.037 (-0.88)	0.273* (1.90)	0.064 (0.56)
260	0.045 (0.26)	-0.115 (-0.67)	0.041 (0.22)	0.033 (0.36)	...	...
387	0.735* (4.20)	-0.318 (-1.13)	0.040 (0.11)	-0.115 (-0.74)	4.881* (1.63)	-1.085 (-0.93)
405	0.101 (0.35)	0.003 (0.07)	-0.039 (-0.51)	-0.095 (-2.37)	-2.093 (-2.31)	-0.099 (0.67)
413	0.240* (4.53)	0.019 (0.15)	-0.031 (-0.15)	-0.136 (-1.66)	-0.470 (-1.57)	0.050 (0.57)
434	-0.019 (-0.18)	0.022 (0.23)	0.038 (0.24)	0.098 (1.40)	0.622 (0.91)	0.122 (0.65)
R^2	0.20	-0.05	-0.08	0.09	0.41	0.30
F	5.20*	0.34	0.48	2.13*	3.09*	3.17*
N	187	155	76	126	31	52

* Represents 10% significance or better for t values, and 5% significance or better for F values.

TABLE 10

COLOMBIA
(READING)

Independent Variables	4th Grade M	4th Grade F	6th Grade M	6th Grade F	12th Grade M	12th Grade F
036			-0.113* (-2.35)	0.024 (0.39)	-0.173* (-1.49)	-0.107 (-1.04)
047			-0.037 (-0.37)	0.165 (1.32)	0.204 (0.94)	-0.089 (-0.49)
051			0.070 (0.99)	0.199* (2.07)	0.913* (2.39)	-0.300 (-1.36)
071			0.048 (0.59)	-0.003 (-0.02)	-0.359 (-1.00)	0.120 (0.43)
178			0.022 (0.31)	-0.137 (-2.21)	...	...
228			-0.036 (-1.44)	-0.023 (-0.68)	...	...
260			-0.030 (-0.19)	-0.157 (-1.06)	...	...
387			0.109 (0.42)	0.205 (0.68)	...	...
405			-0.033 (-0.62)	-0.015 (-0.27)	...	...
413			0.094* (1.32)	-0.348 (-1.07)	...	...
434			-0.205 (-1.75)	0.194* (1.58)	-0.347 (-1.15)	0.051 (0.32)
R^2			0.02	0.02	0.26	-0.11
F			1.57	1.38	2.56*	0.71
N			301	225	23	15

* Represents 10% significance or better for t values, and 5% significance or better for F values.

TABLE 11

COLOMBIA
(SCIENCE)

Independent Variables	4th Grade M	4th Grade F	6th Grade M	6th Grade F	12th Grade M	12th Grade F
036			-0.074* (-1.68)	0.060 (1.09)	-0.197* (-1.33)	0.232 (1.24)
047			-0.131* (-1.43)	-0.167* (-1.48)	0.041 (0.15)	-0.020 (.06)
051			0.002 (0.03)	0.228* (2.65)	0.073 (0.15)	-0.018 (-0.04)
071			0.064 (0.85)	-0.207 (-1.60)	0.187 (0.41)	-0.023 (-0.04)
178			0.007 (0.11)	-0.004 (-0.71)	...	...
228			-0.113 (-4.91)	-0.159 (-5.13)	...	...
260			0.002 (0.01)	0.049 (0.37)	...	...
387			0.023 (0.10)	0.562* (2.07)	...	...
405			-0.055 (-1.15)	-0.253 (-5.06)	...	...
413			0.103* (1.58)	0.701* (2.39)	...	...
434			0.012 (0.11)	0.369* (3.32)	0.014 (0.04)	0.133 (0.45)
R^2			0.08	0.31	-0.15	-0.19
F			3.35*	10.31*	0.41	0.56
N			301	225	23	15

* Represents 10% significance or better for t values, and 5% significance or better for F values.

TABLE 12

MEXICO
(READING)

Independent Variables	4th Grade M	4th Grade F	6th Grade M	6th Grade F	12th Grade M	12th Grade F
036	-0.104* (-3.06)	-0.117* (-2.92)	-0.053* (-1.71)	-0.023 (-0.82)	-0.128* (-2.51)	0.005 (0.11)
047	-0.096* (-1.68)	-0.101* (-1.53)	-0.005 (-0.11)	-0.106* (-2.52)	-0.017 (-0.22)	0.023 (0.35)
051	0.144* (2.62)	0.044 (0.68)	0.059 (1.03)	0.066* (1.40)	0.490* (1.89)	0.372* (1.42)
071	0.080 (1.11)	0.089 (0.96)	0.027 (0.32)	0.115* (1.60)	0.406* (3.47)	-0.232 (-2.55)
178	0.008 (0.24)	-0.040 (-0.87)	-0.034 (-1.06)	-0.062 (-2.07)	0.766* (7.44)	0.001 (0.01)
228	0.104* (2.00)	-0.017 (-0.36)	-0.002 (-0.05)	-0.021 (-0.62)	2.380* (6.57)	-0.526 (-2.47)
260	-0.100 (-1.03)	-0.388 (-3.08)	-0.305* (-2.63)	-0.169* (-1.99)	0.729 (0.27)	-1.296* (-3.47)
387	-0.413 (-2.47)	-0.219 (-1.39)	0.060 (0.90)	0.042 (0.55)	...	1.493* (3.20)
405	0.054* (1.50)	0.057* (1.33)	0.090* (2.43)	0.033 (0.79)	...	-0.510 (-3.67)
413	0.192 (0.61)	-0.324 (-0.88)	0.131* (1.79)	0.049* (1.44)	...	...
434	-0.019 (-0.26)	-0.038 (-0.53)	-0.071 (-1.31)	0.062 (1.17)	-5.631 (-6.31)	0.637* (2.23)
R^2	0.16	0.10	0.03	0.07	0.48	0.35
F	6.19*	4.64*	2.03*	3.47*	14.02*	7.59*
N	308	376	351	381	116	126

* Represents 10% significance or better for t values, and 5% significance or better for F values.

TABLE 13

MEXICO
(SCIENCE)

Independent Variables	4th Grade M	4th Grade F	6th Grade M	6th Grade F	12th Grade M	12th Grade F
036	-0.060* (-1.58)	-0.077* (-2.08)	-0.063* (-1.54)	-0.068* (-2.27)	-0.043 (-0.70)	0.008 (0.10)
047	-0.174* (-2.72)	-0.021 (-0.34)	-0.061 (-0.98)	-0.022 (-0.49)	-0.078 (-0.84)	-0.062 (-0.54)
051	-0.026 (-0.43)	0.149* (2.48)	0.072 (0.95)	0.143* (2.80)	0.495* (1.61)	-0.236 (-0.52)
071	0.091 (1.12)	-0.010 (-0.12)	-0.163 (-1.44)	0.143* (1.86)	0.277* (1.99)	-0.266 (-1.69)
178	0.029 (0.76)	-0.101 (-2.35)	-0.008 (-0.19)	-0.021 (-0.66)	0.612* (4.98)	0.168 (1.22)
228	0.080* (1.36)	0.034 (0.77)	0.108* (2.04)	0.026 (0.72)	1.685* (3.92)	-0.263 (-0.72)
260	-0.084 (-0.78)	-0.355* (-3.03)	-0.820* (-5.36)	-0.304* (-3.34)	-0.145 (-0.46)	-0.734 (-1.14)
387	-0.357 (-1.92)	-0.344 (-2.36)	-0.131 (-1.49)	-0.012 (-0.15)	...	1.447* (1.80)
405	-0.031 (-0.77)	-0.037 (-0.95)	0.254* (5.18)	0.179* (3.98)	...	-0.240 (-1.00)
413	0.307 (0.86)	-1.202 (-3.52)	0.200* (2.06)	0.026 (0.72)	...	...
434	-0.074 (-0.89)	-0.195 (-2.91)	-0.291 (-4.10)	0.090* (1.61)	-3.868 (-3.65)	0.345 (0.70)
R^2	0.16	0.16	0.19	0.10	0.37	0.16
F	6.24*	7.75*	8.24*	4.94*	9.45*	3.31*
N	308	376	351	381	116	126

* Represents 10% significance or better for t values, and 5% significance or better for F values.

TABLE 14

PARAGUAY
(READING)

Independent Variables	4th Grade M	4th Grade F	6th Grade M	6th Grade F	12th Grade M	12th Grade F
036	-0.103* (-2.57)	-0.120* (-3.33)	-0.173* (-4.81)	-0.049* (-1.32)	-0.010 (-0.28)	-0.075* (-2.08)
047	-0.198* (-2.79)	-0.281* (-4.46)	-0.270* (-4.50)	-0.198* (-3.05)	0.027 (0.46)	-0.120* (-2.18)
051	0.120* (1.82)	0.200* (3.28)	0.117* (1.80)	0.296* (3.89)	0.178* (1.73)	0.052 (0.53)
071	0.123* (1.58)	0.044 (0.68)	0.272* (3.32)	0.296* (3.29)	0.013 (0.17)	0.119* (1.42)
178	-0.003 (-0.08)	-0.021 (-0.72)	0.026 (0.76)	-0.040 (-1.33)	-0.097 (-1.15)	-0.103 (-1.78)
228	0.015 (0.18)	0.018 (0.28)	-0.018 (-0.26)	0.094 (1.20)	0.097 (0.90)	0.358* (4.53)
260	0.188 (1.69)	0.110 (1.03)	0.215 (2.87)	0.278 (2.78)	0.558 (3.10)	0.287 (3.12)
387	0.260* (1.46)	0.153 (0.97)	0.325* (1.67)	0.068 (0.35)	-0.092 (-1.74)	0.070 (1.27)
405	0.065* (1.41)	0.034 (0.77)	0.048* (1.30)	0.147* (3.67)	0.101 (1.29)	-0.045 (-0.78)
413	0.098 (1.05)	0.079 (0.96)	-0.153 (-1.63)	-0.164 (-2.00)	0.019 (0.32)	-0.022 (-0.52)
434	-0.110 (-1.12)	-0.232 (-2.55)	0.027 (0.40)	0.070 (0.99)	0.070 (0.65)	-0.084 (-0.89)
R^2	0.23	0.27	0.37	0.37	0.08	0.19
F	7.75*	12.06*	18.60*	18.84*	3.60*	5.67*
N	246	334	332	342	328	224

* Represents 10% significance or better for t values, and 5% significance or better for F values.

TABLE 15

PARAGUAY
(SCIENCE)

Independent Variables	4th Grade M	4th Grade F	6th Grade M	6th Grade F	12th Grade M	12th Grade F
036	-0.106 * (-2.86)	-0.144 * (-3.69)	-0.115 * (-3.03)	-0.048 * (-1.33)	0.046 (1.24)	-0.035 (-0.70)
047	-0.231 * (-3.55)	-0.338 * (-4.90)	-0.267 * (-4.17)	-0.126 * (-2.03)	0.016 (0.27)	-0.070 (-0.92)
051	0.315 * (5.16)	0.016 (0.24)	0.097 * (1.39)	0.202 * (2.77)	0.025 (0.24)	0.216 * (1.55)
071	0.057 (0.80)	0.050 (0.71)	0.139 * (1.60)	0.243 * (2.83)	-0.063 (-0.82)	0.026 (0.22)
178	0.008 (0.24)	-0.023 (-0.72)	0.036 (1.00)	0.017 (0.59)	0.049 (0.58)	-0.010 (-0.12)
228	0.018 (0.23)	0.135 * (1.96)	-0.054 (-0.72)	-0.106 (-1.41)	0.085 (0.78)	0.193 * (1.74)
260	0.336 (3.29)	0.199 (1.72)	0.221 (2.76)	0.233 (2.43)	0.813 (4.49)	0.201 (1.56)
387	0.343 * (2.10)	0.240 * (1.41)	0.171 (0.83)	-0.072 (-0.38)	-0.132 (-2.49)	-0.035 (-0.43)
405	0.027 (0.63)	0.024 (0.51)	0.039 (0.97)	0.060 * (1.58)	0.207 * (2.65)	0.020 (0.34)
413	0.105 (1.24)	-0.080 (-0.89)	-0.139 (-1.39)	-0.124 (-1.59)	-0.024 (-0.4)	-0.098
434	-0.060 (-0.67)	-0.254 (-2.57)	0.014 (0.20)	0.087 * (1.28)	0.167 * (1.53)	0.209 (1.60)
R^2	0.43	0.28	0.26	0.20	0.13	0.14
F	17.84 *	12.86 *	11.45 *	8.96 *	5.47 *	4.22 *
N	246	334	332	342	328	224

* Represents 10% significance or better for t values, and 5% significance or better for F values.

TABLE 16

PERU
(READING)

Independent Variables	4th Grade M	4th Grade F	6th Grade M	6th Grade F	12th Grade M	12th Grade F
036	-0.033 (-0.45)	-0.097* (-1.59)	-0.076 (-1.09)	-0.095 (-1.23)	-0.162* (-2.95)	-0.085* (-1.70)
047	-0.158 (-0.99)	-0.297* (-2.80)	-0.071 (-0.53)	-0.085 (-0.69)	-0.132* (-1.57)	-0.009 (-0.09)
051	0.397* (3.18)	0.065 (0.68)	0.714* (6.21)	0.203* (1.39)	0.199* (1.50)	0.454* (3.03)
071	-0.034 (-0.21)	0.277* (1.79)	-0.174 (-1.13)	-0.151 (-0.59)	-0.186 (-1.65)	-0.084 (-0.52)
178	-0.014 (-0.15)	0.112 (0.79)	0.053 (0.98)	0.282* (2.88)	-0.351 (-2.58)	-0.059 (-0.62)
228	...	...	...	...	...	...
260	-0.226 (-0.64)	-0.233 (-0.65)	0.045 (0.24)	-0.158 (-0.46)	-1.900* (-3.76)	-0.144 (-0.64)
387	0.451 (1.22)	-0.280 (-0.82)	0.807* (3.29)	0.332 (1.30)	-3.655 (-3.05)	-.888 (1.39)
405	0.116 (0.89)	-0.127 (-1.13)	0.050 (0.89)	0.072 (0.93)	0.153 (0.78)	-0.059 (-0.95)
413	0.135 (0.32)	-1.201 (-2.57)	-0.154 (-2.23)	-0.051 (-0.70)	3.750* (3.48)	-0.271 (-1.51)
434	-0.105 (-0.93)	0.020 (0.19)	-0.322 (-1.83)	-0.090 (-0.35)	-0.540 (-2.24)	0.530* (3.81)
R^2	0.07	0.29	0.15	0.17	0.27	0.33
F	2.05*	6.38*	3.76*	3.87*	4.06*	7.06*
N	138	132	152	141	84	124

* Represents 10% significance or better for t values, and 5% significance or better for F values.

TABLE 17

PERU
(SCIENCE)

Independent Variables	4th Grade M	4th Grade F	6th Grade M	6th Grade F	12th Grade M	12th Grade F
036	-0.030 -0.45	-0.123 * (-1.89)	-0.051 (-0.98)	0.072 (1.18)	-0.127 (-0.36)	0.003 (0.04)
047	-0.247 * (-1.72)	-0.054 (-0.48)	-0.039 (-0.39)	-0.140 * (-1.43)	-0.086 (-0.69)	-0.149 (-0.96)
051	0.334 * (2.96)	0.105 (1.04)	0.140 * (1.63)	0.099 (0.85)	0.152 (0.78)	0.191 (0.85)
071	0.445 * (3.09)	0.053 (0.32)	-0.110 (-0.95)	-0.390 (-1.92)	-0.134 (-0.812)	-0.091 (-0.37)
178	-0.009 (-0.11)	0.308 * (2.05)	0.020 (0.49)	0.187 * (2.48)	-0.528 (-2.65)	-0.106 (-0.736)
228	...	...	...	...	...	...
260	-0.251 (-0.78)	-0.061 (-0.160)	0.079 (0.57)	0.388 (1.42)	-3.986 * (-5.40)	-0.049 (-0.14)
387	0.620 * (1.85)	-0.160 (-0.44)	0.360 * (1.96)	0.346 * (1.70)	-4.086 (-2.33)	-0.240 (-0.25)
405	0.261 * (2.21)	-0.163 (-1.37)	0.006 (0.14)	0.037 (0.61)	0.158 (0.55)	0.0007 (0.007)
413	0.377 (0.99)	-1.057 (-2.13)	0.110 * (2.12)	-0.029 (-0.50)	6.197 * (3.93)	0.004 (0.01)
434	0.018 (0.18)	-0.150 (-1.33)	-0.392 (-2.97)	-0.017 (-0.08)	-1.378 (-0.87)	0.429 * (2.05)
R^2	0.19	0.20	0.14	0.11	0.32	0.02
F	4.17*	4.28 *	3.48*	2.75*	4.86*	1.26
N	138	132	152	141	84	124

* Represents 10% significance or better for t values, and 5% significance or better for F values.

TABLE NO. 18

FREQUENCY OF SIGNIFICANCE AT 10% OR BETTER,
ONE-TAIL TEST

Grade Variable	4th	6th	12th
036	11 (46)	11 (39)	10 (36)
047	17 (71)	13 (46)	5 (18)
051	13 (54)	11 (39)	12 (42)
071	9 (37)	7 (25)	3 (11)
178	2 (8)	6 (21)	7 (25)
228	3 (15)	4 (17)	8 (33)
260	2 (8)	9 (32)	3 (11)
387	6 (25)	6 (21)	3 (11)
405	8 (33)	7 (25)	3 (11)
413	5 (21)	9 (32)	3 (11)
434	1 (4)	5 (18)	5 (18)

NOTE: Each variable has been tested 28 times (7 countries x 2 sexes x 2 achievement tests) with the exception of: 4th grade is not available in Colombia and variable 228 was not tested for Peru. The numbers in parentheses represent relative frequencies in percents.

observe that this variable becomes more frequently significant as we advance along the educational scale. Nevertheless, as many as 12 times the same variable is significant but with a negative sign, compared to 15 times with positive significance. Four out of those 12 times, the coefficient is negatively significant for fourth grade. Ad hoc theorization would suggest that prestige matters more for higher levels of education, and age of the school building at the lower levels could be associated with poor schools. It must be noted, however, that for Bolivia, in regard to the science test, Table 7 shows variable 178 significant for sixth grade males and females and also for twelfth grade females as positively significant, while fourth grade males results in a negative and significant coefficient. This pattern repeats itself only partially for the Bolivian sample with regard to the science test, as indicated in Table 6. In any case, these results are not sufficient enough to argue strongly in favor of the importance of this variable or what it represents.

Variable 228 measures the total expenditure of labor per student for each sampled school. The frequency of significance grows with a level of schooling; however, this variable comes out with a negative significance 12 times, versus 15 times with positive significance. In the case of this variable, there is no discernible pattern throughout the grades and the lack of stability of the sign precludes any conclusion.

Variable 260 represents three categories of level of income which predominate in the neighborhood of each school in the samples. As will be shown later, this variable is an excellent proxy for a number of physical characteristics and facilities pertaining to the school. Consequently, it should be taken as a proxy for these elements. Even though it comes out

as significant in 14 sub-samples, it is significant of the opposite sign in 11 sub-samples, particularly in Paraguay. In this case, the variable comes as out very significant. It must be emphasized here that the Paraguayan sample is the one having the highest national level of representativeness. The last four variables represent teacher's characteristics, beginning with level of education, years of experience, hours dedicated to teaching per week, and level of satisfaction of the teacher. In total, this group of variables comes out as significant with a positive sign 61 times, but it also comes out significant 50 times with the opposite sign. Again, no strong conclusions can be drawn from these results.

These results are important in light of the fact that the variables included are relevant variables which, on an apriori basis, must show some statistical significance in order to explain variations in achievement. It should also be noted that the analysis of the family background variables, in terms of significance of the opposite sign, does not yield the same results as the school-related variables; in other words, family background variables are either significant with the right sign or not significant at all. There are only 21 exceptions for the first four variables representing family characteristics, compared to 102 cases in which the four variables are significant for different grades, sexes or countries. At the same time, however, it is important to bear in mind that since mental ability of the student was not a variable considered in the model, family background variables might have captured the effect of that missing variable.

Returning to Tables 4 through 17, it must be pointed out that, in general, the level of the coefficients of determination turn out to be rather low. Others are erratic — in Argentina's reading comprehension, for example, the r-square tends to be higher for twelfth graders. The

same thing occurs with respect to the science test shown in Table 5. The results for Bolivia are stronger but unstable from grade-to-grade. It is puzzling to observe, for example, that fourth grade males yield an R-square of 0.32, while females in the same grade yield only 0.11; and, sixth grade males produce a 0.10 R-square while females produce .36. The results concern the reading comprehension test, but they are not consistent with the results for the science test shown on Table 7. In this case, fourth graders tend to show a higher R-square, with the exception of sixth grade females who have an r-square of 0.31 for science vis-a-vis 0.36 of the same sub-sample with regard to reading comprehension.

The results for Brazil are generally very weak for both reading comprehension and science. This might be a result of problems at the level of field work. Frequency distributions of students by school and sex show that the entire Brazilian sample included schools with only females or only males, with the exception of three schools which included both sexes. This highly puzzling condition casts a great deal of doubt on the quality of the entire survey. There is no reason whatsoever for this sampling design to have come out this way. The results for Brazil are presented here for the sake of completeness; at the same time, they might show some patterns which, in spite of that anomaly, could make some sense.

The results for Colombia are also particularly disturbing. The survey was conducted without too much regard for achievement scores or for the purpose of explaining their variations. Inexplicably, the achievement tests for fourth graders were not applied and the sample size for twelfth graders was extremely small. The results of the achievement test shown in the appendix of descriptive statistics for Colombia (in Table

4) indicate that for sixth graders, there were extremely low means for variables 116 and 117 (which are reading comprehension and science). The values for twelfth graders are significantly lower than the corresponding values for all other countries.

The results for Mexico tend to be better, although somewhat weaker for fourth and sixth graders and significantly stronger for twelfth graders. The Mexican sample was professionally administered and carefully taken by the personnel in charge of the field work. This includes the interviewing process at the level of the school. In general, this can also be said about the Argentinian, Bolivian, Paraguayan, and Peruvian samples. However, the problem here seems to be the relative weakness of the instruments used to measure achievement, as was mentioned earlier in this paper.

The results for Paraguay, shown in Tables 14 and 15, are more in line with what was expected in this research. The significance of family background is consistent and decreases with the level of education. This pattern appears in reading comprehension as well in science. In both cases, the school variables tend to come out significant with the right sign, but also significant with the wrong sign in just as many cases.

Finally, the results for Peru, shown in Tables 16 and 17, present the same pattern of instability. For reading comprehension for twelfth graders, for example, the R-square is 0.33, while for science, with the same sub-sample, the R-square is as low as 0.02 and the F value is not significant.

The partition of the sample by grade and sex for each country had the justification of showing different patterns of significance and,

perhaps, certain trends between the coefficients themselves. As shown in Table 18, the decreasing frequency of significance for family background variables as the education level is higher is one of the results that was expected to appear. However, with few exceptions, comparisons between sexes do not show any discernible pattern. From the point of view of structure or frequency of significance between sexes, nothing can be generalized from these results. However, in Bolivia, for example, with regard to the regressions for reading comprehension, girls tend to be more positively sensitive to father's occupational background with respect to achievement. This is especially valid in the case of sixth grade girls in which the coefficient for father's occupation is almost twice the value of the coefficient for boys. This result, however, does not appear in the science test. This type of comparison can only be made when the coefficients for each sex of one particular variable are both significant.

Following the same method, we can observe that for Mexico (Table 12) twelfth grade boys are more strongly favored by variable 51, but again, this result is not consistent with the ones in regarding science (Table 13). On the other hand, the results for Paraguay lend themselves more easily to this type of comparison, given the stability of significance of the family background coefficients, at least for grades four and six. Fourth grade girls appear to be more affected by low occupational status of the father, but the result is opposite for sixth graders. Variable 51, which is the scale measuring the number of books at home, tends to favor girls in both the fourth and sixth grades.

Table 15 shows the results for science in Paraguay which are more consistent for variable 47 and for the sixth grade only in the case of variable 51. In the case of Peru, the lack of stability of significance prevents any type of analaysis for comparisons between sexes.

Nevertheless, in studying the statistical tables in the appendix, boys apparently perform better than girls, in general. This is as valid for reading comprehension as it is for science. An apparent exception is Brazil for twelfth grade, but the differences cannot be regarded as significant given the small sample size. Another exception is reading comprehension for Mexican twelfth graders, as well as for Paraguay for the same sub-sample. In any case, there is not enough information to explain these achievement differentials between sexes; they could result from a number of conditions which will be briefly mentioned here. One of the most obvious considerations may be that motivation can be expected to be higher for boys than for girls, given the social roles assigned by sex. Another possible explanation is that dropout rates might be higher among boys than among girls which leaves the less educationally privileged girls in school longer than the boys of the same socio-economic background. For some grades, the number of girls tends to be greater than the number of boys; however, this pattern is not very consistent. In this regard, the typical examples appear for fourth and six graders in Mexico, but not for twelfth graders. In this grade girls have a significantly higher achievement score for reading comprehension, yet a lower score in science, in addition to having a larger representation than boys. On the other hand, countries like Bolivia seem to have a significantly lower representation of girls in school.

In any case, the achievement scores differentials between sexes are not so large as to warrant any important analysis, in spite of the fact that the differentials result systematically in favor of boys. The weakness of these results might be due to the very fact that the instruments used to measure achievement scores were, in fact, too difficult, as mentioned earlier.

In summary, these results do not show sufficient evidence for the importance of school factors in explaining academic achievement. Yet, it is not evident that school quality does not matter. One possible reason for this failure to capture the relevance of school inputs is the absence of other variables of the school, especially in regard to the teacher. If the teacher plays a crucial role in motivating learning potential of the students, the variables included in the ECIEL survey are not sufficient to reflect that capability of the teacher. A variable that could be weakly related to teacher capability to motivate the students is 413 which measures the number of hours per week which the teacher spends in the classroom. This variable comes out as significant with the positive sign in 17 cases, while it results significant with the negative sign in 12 cases. These relative frequencies of significance slightly suggest that we have captured something in this regard, but it is not possible to conclude anything since the number of hours a teacher dedicates to his classroom might be a result of administrative rules or contractual agreements in the schools. If those schools which tend to hire teachers on a full-time basis are the ones which happen to receive better students, the statistical significance does not prove a causal relationship, but only a reflection of decision rules. Another variable likely to be associated with teacher capability is his level of satisfaction; however, the frequency of significance is too low to draw any conclusion. I will return to a discussion of the possible role of the teacher in the last section of this paper.

V. THE SEPARABILITY OF SCHOOL AND FAMILY FACTORS

One area of concern for many investigators has been the proportion of the achievement variance explained by family factors compared to the

proportion explained by school factors. Nevertheless, this concern could only be meaningful if we accept the hypothesis that the variables explaining achievement do so in an additive fashion. As I argued before, the educational process cannot be seen as the result of an addition process of factors in the production of achievement. But, the issue still remains as to why some researchers, such as that of Heyneman and Loxley (1981), find so much variation in the proportion of achievement variance explained by school factors with respect to variance attributed to family factors. Heyneman and Loxley test an additive specification to a number of countries. There are two basic explanations for these results which have nothing to do with the importance of the school in the educational process. One is the fact that Heyneman and Loxley do not have the same variables in each regression by country, which is a result of applying step-wise regression techniques. Given the large number of school variables included in these surveys, only as a result of sampling error do some variables turn out to be significant just by chance. The greater the number of school variables included, the larger will be number of variables that happen to show statistical significance. The other reason is that as the variables that enter a model by a step-wise regression technique must show significance, as any variable could be included, regardless of the fact that is positively or negatively valued. As I have just shown, many school variables showing significance with the right sign also appeared with negative significance in as many numbers as the former ones.

But, even when the school variables explain a certain proportion of the variations in academic achievement, they might actually be the result of preselection by the student's parents in terms of perceived school quality. I argued this earlier. Statistically, the preselection

process will appear in the regression results as a phenomenon of multicolinearity, which has the effect of confusing the structure of signficance and the level of specific estimates obtained for different samples. In fact, a reason for the school variables not having shown any signficance in the regressions (as presented in the previous section) is the possible presence of multicolinearity between school factors and family factors. It might be that the standard errors of the school factors are overestimated and, consequently, prevent the rejection of null hypotheses of the school variables.

Two tests for multicolinearity were carried out in this research; both are presented in Tables 19 and 20. The first test uses the variable, father's occupation, as a proxy for family background as the dependent variable, and then runs a linear regression on a number of school variables. The second test uses as a dependent variable a scale of average income of the neighborhood, in which the school of each of the interviewed students was located. For the second test, the same set of independent variables was used as for the first one. As shown in Table 19, the indexes of multiple correlation fluctuate between the values of .32 and .73. The results shown in Table 20 are much more striking, since they indicate, for some sub-samples, an almost perfect fit between the level of income of the school neighborhood and the school characteristics chosen for these tests. The independent variables selected were:

State of upkeep of the school
Cleanliness of the school
Chemistry or biology laboratory
Number of school staff
How old is the school main building?
Number of classrooms in the school
Does the school have a library?
Highest level of studies completed by the teacher
Teacher's father's occupation
How many hours a week does teacher teach?
Index of the school facilities

TABLE 19

MULTIPLE R
(FATHER'S OCCUPATION)

	4th Grade		6th Grade		12th Grade	
	M	F	M	F	M	F
Argentina	0.491	0.397	0.520	0.413	0.380	0.357
Bolivia	0.620	0.704	0.732	0.714	0.580	0.563
Brazil	0.529	0.696	0.660	0.629	0.583	0.466
Colombia	...	...	0.497	0.727	...	...
Mexico	0.365	0.596	0.404	0.329	0.585	...
Paraguay	0.558	0.411	0.496	0.560	0.466	0.427
Peru	0.569	0.666	0.528	0.691	...	...

TABLE 20

MULTIPLE R
(RESIDENTIAL SCHOOL)

	4th Grade		6th Grade		12th Grade	
	M	F	M	F	M	F
Argentina	0.804	0.819	0.761	0.755	0.867	0.982
Bolivia	1.000	1.000	1.000	1.000	1.000	1.000
Brazil	0.796	0.742	0.855	0.827	...	...
Colombia	...	...	0.744	0.932	...	...
Mexico	0.942	0.888	0.994	0.953	...	...
Paraguay	0.885	0.765	0.940	0.790	0.981	0.993
Peru	0.878	0.800	0.639	0.794	...	...

Table 19 does not present indexes high enough to establish the level of multicolinearity necessary to produce a strong overestimation of standard error in school factor coefficient. Even though the lack of significance of school variables simply cannot be explained by the effects of multicolinearity, it is surprising that no school factors show any significant statistical relationship with variations in achievement. The results of Table 20 strongly indicate that any research based on data not gathered through sampling designs which explicitly take possibilities of preselection into account, might show statistical significance of school factors which are meaningless. To prevent this from happening, sampling designs must include a form of stratification which forces the inclusion of students from different family backgrounds attending schools with different levels of physical facilities or quality. This, of course, will require a pre-survey focusing on the conditions of the schools and the type of students which could be included in a final sample, and will impact the costs incurred for this type of survey. However, sampling design is not the only procedure which should considered, since it might happen that preselection is so strong that, for example, very few children from a low family background can be found in schools of high quality and vice versa. The design of any questionnaire must consider the decision-making process involved with family size and choice of school. Moreover, it is necessary to identify explicitly those procedures by which children are assigned to different schools, as in the case of the public school system within each country.

In order to further test for some degree of association between levels of achievement and school factors, achievement means were calculated for each grade, sex and country, as well as three categories of

schools: private schools, subdivided into lay and religious, and public schools. The results presented in Table 21 do not show significant differences for Argentina, Brazil, Colombia or Paraguay, but they appear significant for Bolivia, Mexico and Peru, e.g., private schools are associated with higher achievement scores. However, these results do not indicate school effects per se since they are possibly correlated with family characteristics, not only through preselection, but also because families with the ability to pay for private education tend to be the ones who also have higher levels of parental education. This is another perspective of the same problem of multicolinearity.

Means of father's occupation were calculated for each sub-sample, as well as for each type of school, and the results show that the father's occupation tends to be higher level for students in private schools in practically every country in the ECIEL study. This is particularly valid for twelfth graders.

In exploring the possible role of attitudinal variables in explaining achievement, preliminary tests show no significance in a variable measuring the level of educational aspiration of students. This is not really a surprising result if we consider the fact that aspirations reported by the student refer to the level of final education and are not necessarily closely linked to aspirations regarding levels of achievement. On the other hand, the relationship between aspirations and levels of achievement will not be easily observed in those school systems functioning under rules of automatic promotion from grade to grade.

Two simple correlation coefficients were estimated for each sub-sample by grade, sex and country. One correlation coefficient was calculated between achievement scores in reading comprehension and occupational level of the father; the other correlation coefficient was

TABLE 21

READING COMPREHENSION MEANS
BY TYPE OF SCHOOL

	4th Grade		6th Grade		12th Grade	
	M	F	M	F	M	F
Argentina						
Lay	14.14	11.56	13.95	17.11	24.68	22.03
Religious	12.41	14.77	17.06	17.87	21.05	24.61
Public	13.06	13.01	16.12	14.96	21.38	20.29
Bolivia						
Lay	12.50	10.29	14.07	13.29	12.45	17.00
Religious	13.94	15.06	12.96	13.38	17.80	17.93
Public	10.73	9.41	11.34	11.00	13.76	13.85
Brazil						
Lay	*	*	*	*	19.32	21.76
Religious	18.99	19.48	20.36	19.47	*	11.69
Public	18.96	18.02	17.97	17.78	15.99	15.00
Colombia						
Lay	N.A.	N.A.	9.80	10.51	*	12.15
Religious	N.A.	N.A.	10.98	10.74	*	*
Public	N.A.	N.A.	8.99	8.67	14.09	*
Mexico						
Lay	16.33	14.09	18.09	16.85	12.13	23.34
Religious	13.09	14.93	15.47	16.87	24.89	17.51
Public	11.95	12.07	14.96	14.33	13.87	15.72
Paraguay						
Lay	12.54	12.66	14.77	15.42	14.55	17.52
Religious	13.56	11.55	13.49	15.60	15.85	16.81
Public	14.43	14.38	18.26	18.26	17.39	14.93
Peru						
Lay	10.47	14.07	13.36	15.85	15.50	21.05
Religious	14.68	14.50	15.29	16.20	19.43	15.90
Public	10.65	8.91	11.57	10.53	15.15	15.64

* Less than ten cases.

estimated between father's occupation and level of educational aspiration reported by the student. In the ECIEL survey, there are two questions relating to aspirations -- one question refers to the "desired" level of education, and the other question refers to the "expected" level of education. In carrying out this test, the second variable was preferred as a measurement of aspiration. This is because it is presumably based on a more realistic appraisal of possibilities and is, consequently, a more concrete definition of aspiration rather than just a superficially reported desire for a higher level of education.

The results of the test are shown in Table 22. One interesting finding is that the level of correlation between achievement and father's occupation appears to be higher for girls than for boys. Why this is so is an issue that goes beyond the domain of my competence. It should be pointed out, however, that it does not seem possible insofar as explaining these differentials in correlation coefficients by the sizes of each sub-sample, or by different degrees of representativeness of girls and boys in the school system. Another interesting result is that the correlation coefficient between achievement and father's occupation tends to move with the correlation coefficient of occupation and level of aspiration. A possible explanation is that when families develop educational aspirations for their children, which are consistent with their own socio-economic status, children might react to those aspirations by trying to achieve accordingly in school. This consideration obviously contradicts the previous one explaining the lack of statistical significance of the same variable by explaining variations in achievement. At the same time, the results of Table 22 are not necessarily inconsistent with a lack of significance of aspirations in explaining achievement since the correlation

TABLE 22

SIMPLE CORRELATION COEFFICIENTS

	4th Grade		6th Grade		12th Grade	
	M	F	M	F	M	F
Argentina						
R-Ach.-Occ.	0.26	0.33	0.21	0.26	0.13	0.24
Occ.-Asp.	0.18	0.34	0.26	0.31	0.24	0.26
Bolivia						
R-Ach.-Occ.	0.30	0.43	0.45	0.43	0.29	0.34
Occ.-Asp.	0.33	0.45	0.32	0.42	0.16	0.36
Brazil						
R-Ach.-Occ.	0.24	0.01	0.27	0.11	0.21	0.10
Occ.-Asp.	0.26	0.22	0.03	0.17	0.24	0.12
Colombia						
R-Ach.-Occ.	N.A.	N.A.	0.06	0.10	0.08	0.32
Occ.-Asp.	N.A.	N.A.	0.27	0.17	0.28	0.06
Mexico						
R-Ach.-Occ.	0.28	0.32	0.10	0.31	0.19	0.36
Occ.-Asp.	0.28	0.25	0.29	0.32	0.22	0.18
Paraguay						
R-Ach.-Occ.	0.37	0.45	0.52	0.55	0.14	0.12
Occ.-Asp.	0.38	0.44	0.37	0.43	0.12	0.11
Peru						
R-Ach.-Occ.	0.24	0.43	0.29	0.32	0.29	0.32
Occ.-Asp.	0.10	0.12	0.19	0.13	0.31	0.07

is, on the one hand, relatively weak, and on the other, the effect on a bivariate relationship is going to be different than the effects captured through the multivaried test.

In any case, these results at least allow us to speculate in terms of the importance of motivational factors in explaining achievement. Yet it is important to realize that the variable on reported aspirations is not necessarily a good measurement for motivation because of the frequent inconsistency between reported attitudes and actual attitudes. In spite of all these thoughts, however, educational aspirations could be seen as a proxy variable for motivation which, at the same time, could be analyzed as a factor which operates on educational achievement with a certain amount of independence of student mental ability. In fact, these two types of variables, ability and motivation, could be the most important missing variables in this type of research. What we actually have are remote proxies for some of these variables, although in the case of ability, it is not possible to claim that the ECIEL survey has one single variable that could even qualify as a proxy.

VI. CONCLUSIONS

This research has produced two types of results: the first is obvious and expected, and deals with the fact that family factors matter in the production of academic achievement and that its importance decreases as we move up in the educational scale. The other type of result is surprising: almost no school factors, as observed by the ECIEL variables, seem to have any importance in explaining academic achievement.

I do not hesitate to propose that the fundamental implications of this research are not only the need to carry out further research, but also to revise the methods by which research, in regard to this topic, has been carried out thus far. Too much emphasis has been placed on statistical techniques and computer applications in handling this type of investigation, and highly insufficient attention has been given to the crucial problems of measurement. Any effectively serious scientific endeavor must consider the problems of measurement as a basic methodological condition for success. With this perspective, and with the experience accumulated in this field, it seems to me that a fundamental school input has been left out of this survey: the teacher. It is true that a number of teacher characteristics were observed and carefully measured; however, some potentially important elements must be considered in future research designs. The interaction between teacher and student must be studied much more meticulously. It is not enough to mechanically correlate only the very visible teacher characteristics with student achievement. If the teacher has a certain amount of influence on the student's achievement, this type of research will have to associate statistically each student with his current teacher, as well as his entire previous sequence of teachers. It is also necessary to observe individual forms of teacher behavior which could possibly motivate the student to achieve academically. If the teacher, through his motivational influence, is able to awaken the student's desire for learning, then other school inputs might become relevant. I argued earlier that the simple physical presence of school facilities is not enough to demonstrate that those inputs matter in the educational process. From the perspective of educational and economic policies designed to promote

academic achievement, or to reduce dropout rates, the relevant instruments might be more of a procedural type than of a physical type. If the teacher motivates the student to learn, then the student will opt for the educational facilities offered by the school. In that case, the lack of those facilities might be a bottleneck towards academic achievement. But, if we take into account that, even within a group of highly trained teachers, we can expect wide variations in their capabilities to motivate the student's learning attitudes and energies, it should not be surprising that this research does not show the importance of school inputs.

The obtention of the relevant information to pinpoint those factors which could effectively promote achievement is not easy; it involves the application of more elaborate and imaginative techniques, which can be more costly. It does not seem enough to simply collect data by just taking a questionnaire to the individuals involved in the educational process. Techniques for measurement of academic achievement seem to be very well developed and the fact that the ECIEL survey does not seem to have produced enough significant variance in student's achievement is an independent question. However, it seems necessary to produce better observations regarding students' mental ability independent of measurements of achievement. Concerning the school factors, the limitations of simple application of questionnaires are much more critical because process variables might be much more important than physical ones.

I believe it is necessary to formulate a taxonomy of teachers' attributes which can be systematically observed in regard to motivational capabilities. A first step in this direction, in terms of research design, could be to obtain a large sample of teachers, preferably in the lower

levels of education, to reduce the effect of previous teachers, controlling at the level of data collection for variables such as class size and other school characteristics. The teacher's students' achievement can be observed to identify those teachers who seem to produce higher levels of achievement in their students. Then, those teachers can be observed on a systematic basis in their own classroom to determine behavioral patterns at a microscopic level which can then be used to construct a taxonomy.[6]

It would be redundant to repeat here the importance of this type of research to promote educational quality, especially in underdeveloped countries or less privileged social groups. It is necessary to emphasize that the promotion of process variables might be a less expensive proposition than trying to promote educational development through investment in physical facilities only. The quality of the physical facilities is not even a necessary condition for the learning processes, but certain minimums might have to be identified. The existence of thresholds, in terms of school inputs below which the educational process could be less efficient than possible, requires us to concentrate our attention on those elements which might connect the child with the school factors.

The necessary physical facilities could be minimal — a room, a blackboard, seating facilities, and some basic supplies, such as textbooks, at least for the lower levels of education. Higher levels of education and technical schools could generally demand a more complex arrangement of inputs, but the teacher will always be the force behind the student, motivating him to learn. After determining the conditions with which the teacher could be the factor to substitute for family background deficiencies, the next issue would be how to promote those particular

motivational capabilities of the teacher. Supposedly, they can be part of the teacher's training, but the training, per se, without the willingness on the part of the teacher to apply his training, is not a sufficient condition for effective teaching. This means that teacher training is a necessary, but not a sufficient, condition for the production of education. But, another necessary, yet not sufficient condition, is the level of dedication and effort that the teacher would put into his work. It is not unrealistic to think that an administrative system at the school level which compensates the teacher by his capability to produce education, through reflections via his income, could be an effective instrument for the improvement of the educational process. I am aware that this proposition is far from the central theme of this research, and, at the same time, might sound a bit extemporaneous. However, the final objective of all these research efforts is to identify those policy instruments which can improve the production of education.

Production function theory helps us to understand the relative importance of factors in any production process. If one particular factor is necessary, but not present in sufficient amounts, and if, in addition, that factor is not easily substituted with other factors, the excessive use of other cooperating factors will be wasteful.

STATISTICAL APPENDIX

NOTE: The figures represent mean values of the variables shown, standard deviations (in parentheses) and coefficient of variations.

APPENDIX I

ARGENTINA
DESCRIPTIVE STATISTICS

Variables	4th Grade M	4th Grade F	6th Grade M	6th Grade F	12th Grade M	12th Grade F
116	12.91 (6.22) .48	12.63 (5.59) .44	14.84 (5.65) .38	15.04 (5.35) .36	21.62 (5.87) .27	19.41 (5.41) .28
117	11.38 (4.27) .37	10.82 (3.85) .35	13.99 (4.65) .33	13.85 (4.37) .31	17.41 (4.24) .24	14.79 ((4.02) .27
036	2.27 (2.13) .94	2.18 (1.60) .73	2.66 (1.89) .71	2.31 (1.77) .76	1.74 (0.86) .49	2.24 (1.50) .35
047	5.18 (1.37) .26	5.20 (1.33) .26	5.25 (1.54) .29	5.41 (1.45) .27	3.88 (1.45) .37	4.24 (1.50) .35
051	2.67 (0.98) .37	2.77 (0.98) .35	2.78 (0.83) .30	2.73 (0.81) .30	3.59 (0.50) .14	3.66 (0.55) .15
071	2.50 (0.72) .29	2.65 (0.58) .22	2.53 (0.62) .24	2.63 (0.63) .24	2.32 (0.68) .29	1.79 (0.49) .27
178	37.50 (25.89) .69	36.53 (23.70) .55	34.71 (26.25) .76	39.61 (25.12) .63	24.44 (13.50) .55	12.41 (10.36) .83
228 (in millions)	2.10 (1.22) .58	2.27 (1.39) .61	2.24 (1.35) .60	2.29 (1.41) .61	0.92 (0.48) .52	0.45 (0.15) .33
260	2.47 (0.50) .20	2.40 (0.49) .20	2.50 (0.50) .20	2.42 (0.49) .20	2.29 (0.63) .27	2.24 (0.51) .23
387	5.40 (0.58) .11	5.40 (0.68) .13	5.63 (0.69) .12	5.68 (0.68) .12	6.35 (1.07) .17	6.28 (1.19) .19
405	9.45 (6.36) .67	12.56 (7.03) .56	9.18 (5.85) .64	8.67 (5.48) .63	10.73 (7.05) .66	10.72 (6.15) .57
413	22.15 (6.48) .29	21.90 (5.16) .23	21.99 (6.87) .31	21.70 (5.46) .25	15.32 (6.08) .40	15.07 (6.06) .40
434	1.44 (0.54) .37	1.32 (0.53) .40	1.44 (0.60) .42	1.39 (0.53) .38	1.59 (0.50) .31	1.66 (0.48) .29
N	163	163	154	169	34	29

APPENDIX II

BOLIVIA
DESCRIPTIVE STATISTICS

Variables	4th Grade M	4th Grade F	6th Grade M	6th Grade F	12th Grade M	12th Grade F
116	13.53	11.00	12.38	11.88	16.02	15.42
	(5.78)	(3.97)	(4.83)	(5.76)	(5.16)	(5.85)
	.43	.36	.39	.48	.32	.38
117	11.30	10.57	10.96	11.50	11.64	10.22
	(4.97)	(3.55)	(3.93)	(4.18)	(4.62)	(3.85)
	.44	.33	.36	.36	.40	.38
036	3.72	3.94	4.00	4.23	4.69	4.11
	(2.08)	(1.81)	(1.96)	(2.31)	(2.42)	(1.86)
	.56	.46	.49	.55	.52	.45
047	4.81	5.00	5.03	4.58	4.31	3.91
	(1.58)	(1.49)	(1.39)	(1.66)	(1.63)	(1.59)
	.33	.30	.28	.36	.38	.41
051	2.90	3.17	3.06	3.29	3.35	3.47
	(1.04)	(0.87)	(0.88)	(0.85)	(0.71)	(0.69)
	.36	.27	.29	.26	.21	.20
071	2.49	2.60	2.50	2.73	2.32	2.16
	(0.73)	(0.60)	(0.63)	(0.53)	(0.54)	(0.54)
	.29	.23	.25	.19	.23	.25
178	15.04	7.85	11.32	11.37	17.25	16.05
	(15.10)	(11.04)	(10.34)	(12.37)	(15.97)	13.14
	1.00	1.41	.91	1.09	.92	.82
228	1633.14	2322.04	1466.61	1763.10	1224.91	1240.51
	(2031.63)	(3112.46)	(1631.75)	(2306.50)	(354.49)	(271.28)
	1.24	1.34	1.11	1.30	.29	.22
260	2.32	2.66	2.59	2.50	2.13	2.31
	(0.70)	(0.48)	(0.49)	(0.50)	(0.34)	(0.47)
	.30	.18	.19	.20	.16	.20
387	4.99	5.17	5.36	5.23	5.47	6.09
	(0.61)	(0.61)	(0.67)	(0.65)	(0.79)	(0.99)
	.12	.12	.12	.12	.14	.16
405	14.49	12.17	12.94	11.27	6.91	4.93
	(8.96)	(7.04)	(6.60)	(7.29)	(6.82)	(2.73)
	.62	.58	.51	.65	.99	.55
413	22.97	22.13	21.81	21.42	22.19	22.96
	(3.32)	(3.42)	(6.48)	(7.66)	(7.21)	(8.89)
	.14	.15	.30	.36	.32	.39
434	1.65	1.34	1.85	1.75	1.58	1.31
	(0.70)	(0.48)	(0.79)	(0.95)	(0.74)	(0.47)
	.42	.36	.43	.54	.47	.36
N	134	53	109	52	129	55

APPENDIX III

BRAZIL
DESCRIPTIVE STATISTICS

Variables	4th Grade M	4th Grade F	6th Grade M	6th Grade F	12th Grade M	12th Grade F
116	19.44	18.03	19.37	18.09	18.16	20.42
	(6.98)	(6.20)	(6.88)	(4.99)	(5.25)	(6.18)
	.36	.34	.35	.27	.29	.30
117	15.59	14.07	16.16	15.01	16.87	13.40
	(6.20)	(4.48)	(5.47)	(4.11)	6.00	(4.07)
	.40	.32	.34	.27	.35	.30
036	4.10	4.65	4.22	4.33	4.58	5.12
	(2.68)	(3.13)	(2.87)	(2.77)	(3.20)	(3.10)
	.65	.67	.68	.64	.70	.60
047	4.49	4.83	4.51	4.92	3.85	3.73
	(1.61)	(1.47)	(1.56)	(1.74)	(1.24)	(1.24)
	.36	.30	.34	.35	.32	.33
051	3.30	3.16	3.43	3.28	3.85	3.85
	(0.87)	(0.90)	(0.74)	(0.83)	(0.37)	(0.36)
	.26	.28	.21	.25	.10	.09
071	2.54	2.43	2.30	2.44	2.03	1.98
	(0.57)	(0.63)	(0.61)	(0.54)	(0.71)	(0.58)
	.22	.26	.26	.22	.35	.29
178	8.03	7.74	6.83	5.90	11.87	8.73
	(4.32)	(4.42)	(4.65)	(3.75)	(4.11)	(4.31)
	.54	.57	.68	.63	.35	.49
228	51459.29	56032.03	114096.28	108348.20	435924.48	207330.31
	(27201.03)	(28109.54)	(82732.59)	(69555.10)	(160943.49)	177813.63
	.52	.50	.72	.64	.37	.86
260	2.34	2.35	2.21	2.35	2.00	2.00
	(0.47)	(0.48)	(0.60)	(0.62)	(0.00)	(0.00)
	.20	.20	.27	.26	—	—
387	5.61	5.61	6.33	6.00	6.71	6.88
	(0.64)	(0.62)	(0.99)	(1.12)	(0.46)	(0.32)
	.11	.11	.16	.19	.07	.05
405	8.84	8.52	7.49	6.18	8.03	7.90
	(4.97)	(5.13)	(5.85)	(5.01)	(2.11)	(3.06)
	.56	.60	.78	.81	.26	.39
413	23.91	24.63	23.61	24.31	21.48	25.19
	(7.60)	(7.65)	(8.39)	(9.10)	(11.48)	(16.67)
	.32	.31	.35	.37	.53	.66
434	2.34	2.17	1.83	1.75	1.87	1.90
	(0.77)	(0.78)	(0.68)	(0.64)	(0.85)	(1.07)
	.33	.36	.37	.36	.45	.56
N	187	155	76	126	31	52

APPENDIX IV

COLOMBIA
DESCRIPTIVE STATISTICS

Variables	4th Grade M	4th Grade F	6th Grade M	6th Grade F	12th Grade M	12th Grade F
116			10.37	9.71	14.17	12.60
			(4.55)	(4.48)	(4.33)	(2.61)
			.44	.46	.31	.21
117			9.24	7.96	10.22	7.53
			(3.91)	(4.11)	(3.49)	(2.59)
			.42	.52	.34	.34
036			4.02	3.77	4.83	6.13
			(2.49)	(2.61)	(2.25)	(3.46)
			.62	.69	.46	.56
047			5.15	4.62	4.57	5.00
			(1.49)	(1.58)	(1.38)	(1.36)
			.29	.34	.30	.27
051			2.85	3.21	3.48	3.47
			(1.02)	(1.01)	(0.59)	(0.83)
			.36	.32	.17	.24
071			2.54	2.75	2.70	2.47
			(0.70)	(0.55)	(0.47)	(0.52)
			.27	.20	.17	.21
178			14.70	20.27	7.83	25.20
			(9.58)	(13.49)	(12.74)	(18.76)
			.65	.66	1.62	.74
228			1298.17	1714.92	5672.57	2686.60
			(1104.08)	(1189.69)	(2189.72)	(3224.60)
			.85	.69	.38	1.20
260			2.34	2.12	2.00	2.00
			(0.53)	(0.67)	(0.00)	(0.00)
			.23	.32	...	...
387			5.68	5.25	7.13	7.60
			(0.87)	(0.87)	(0.34)	(0.51)
			.15	.16	.05	.07
405			10.81	12.04	12.87	23.20
			(9.18)	(7.69)	(7.58)	(11.16)
			.85	.64	.59	.48
413			28.40	28.63	22.26	23.20
			(7.39)	(3.61)	(0.69)	(1.01)
			.26	.13	.03	.04
434			1.68	1.55	1.87	1.40
			(0.58)	(0.57)	(0.34)	(0.51)
			.34	.37	.18	.36
N			301	225	23	15

APPENDIX V

MEXICO
DESCRIPTIVE STATISTICS

Variables	4th Grade M	4th Grade F	6th Grade M	6th Grade F	12th Grade M	12th Grade F
116	14.50	12.98	16.96	14.92	18.09	19.42
	(5.74)	(5.62)	(5.42)	(4.71)	(6.89)	(5.95)
	.39	.43	.32	.32	.38	.31
117	13.18	10.84	14.26	12.70	15.59	13.44
	(5.75)	(4.72)	(5.47)	(4.29)	(6.16)	(5.13)
	.44	.43	.38	.34	.39	.38
036	4.48	4.50	4.61	4.86	3.91	4.66
	(2.85)	(2.54)	(2.59)	(2.62)	(2.15)	(2.58)
	.64	.56	.56	.54	.55	.55
047	4.38	4.68	4.50	4.88	3.32	2.95
	(1.74)	(1.80)	(1.77)	(1.77)	(1.66)	(1.65)
	.40	.38	.39	.36	0.50	.56
051	3.27	3.20	3.36	3.17	3.87	3.88
	(0.99)	(0.98)	(0.86)	(0.93)	(0.39)	(0.35)
	.30	.30	.25	.29	.10	.09
071	2.65	2.77	2.70	2.75	2.34	2.32
	(0.62)	(0.52)	(0.51)	(0.51)	(0.59)	(0.62)
	.23	.19	.19	.18	.25	.27
178	23.37	18.40	23.44	20.20	8.72	8.13
	(15.15)	(10.70)	(14.07)	(12.57)	(6.27)	(6.28)
	.64	.58	.60	.62	.72	.77
228	1433.81	1603.25	1599.87	1302.63	2997.48	3777.18
	(815.81)	(1064.67)	(835.17)	(706.01)	(2680.91)	(2154.75)
	.57	.66	.52	.54	.89	.57
260	2.15	2.10	2.29	2.25	2.13	1.88
	(0.56)	(0.57)	(0.58)	(0.53)	(0.34)	(0.62)
	.26	.27	.25	.23	.16	.33
387	5.46	5.90	5.36	5.33	7.34	7.28
	(1.03)	(1.20)	(1.29)	(1.15)	(0.48)	(0.70)
	.19	.20	.24	.21	.06	.10
405	15.05	13.92	13.89	17.98	7.69	7.64
	(7.95)	(7.32)	(8.60)	(7.85)	(3.14)	(6.15)
	.52	.52	.62	.44	.41	.80
413	23.62	23.36	22.77	20.18	10.55	13.94
	(2.71)	(2.28)	(7.93)	(9.43)	(6.82)	(4.99)
	.11	.10	.35	.47	.64	.36
434	1.46	1.73	1.63	1.59	1.22	1.17
	(0.71)	(1.02)	(0.75)	(0.78)	(0.41)	(0.38)
	.49	.59	.46	.49	.33	.32
N	308	376	351	381	116	126

APPENDIX VI

PARAGUAY
DESCRIPTIVE STATISTICS

Variables	4th Grade M	4th Grade F	6th Grade M	6th Grade F	12th Grade M	12th Grade F
116	13.90	12.82	15.61	15.73	16.17	17.72
	(6.36)	(5.87)	(7.22)	(6.92)	(5.88)	(5.90)
	.46	.46	.46	.44	.36	.33
117	12.56	11.10	12.78	12.59	11.92	10.69
	(5.95)	(5.05)	(5.76)	(4.98)	(4.61)	(4.23)
	.47	.45	.45	.40	.39	.39
036	4.20	4.02	4.11	4.24	3.93	4.13
	(2.86)	(2.75)	(2.56)	(2.83)	(2.50)	(2.44)
	.68	.68	.62	.67	.64	.59
047	4.48	4.29	4.41	4.14	3.66	3.65
	(1.74)	(1.66)	(1.74)	(1.63)	(1.49)	(1.60)
	.39	.39	.39	.39	.41	.44
051	2.80	2.90	2.98	3.07	3.41	3.47
	(1.08)	(1.04)	(0.97)	(0.94)	(0.68)	(0.70)
	.38	.36	.32	.31	.20	.20
071	2.59	2.58	2.72	2.77	2.25	2.44
	(0.72)	(0.74)	(0.56)	(0.55)	(0.60)	(0.57)
	.28	.29	.21	.20	.27	.23
178	21.14	34.92	26.41	30.52	30.33	26.57
	(21.30)	(55.41)	(37.73)	(50.22)	(9.30)	(14.80)
	1.01	1.59	1.43	1.64	.31	.56
228	8221.32	8682.66	8326.89	7831.66	14655.87	10892.51
	(4592.40)	(4756.39)	(4940.68)	(4025.85)	(4893.99)	(5670.40)
	.56	.54	.59	.51	.33	.52
260	2.59	2.54	2.43	2.52	2.17	2.17
	(0.58)	(0.55)	(0.66)	(0.57)	(0.41)	(0.77)
	.22	.22	.27	.23	.19	.35
387	5.36	5.30	5.50	5.75	6.44	6.71
	(0.86)	(0.87)	(0.74)	(0.78)	(1.75)	(1.71)
	.16	.16	.13	.13	.27	.25
405	13.36	11.70	16.50	15.36	19.25	11.97
	(7.19)	(6.28)	(8.54)	(9.07)	(6.33)	(7.81)
	.54	.54	.52	.59	.33	.65
413	21.54	24.20	18.73	19.60	38.10	18.72
	(7.75)	(8.98)	(5.41)	(6.36)	(14.34)	(11.08)
	.36	.37	.29	.32	.38	.59
434	1.84	1.76	1.64	1.52	1.18	1.90
	(0.50)	(0.48)	(0.60)	(0.60)	(0.40)	(0.71)
	.27	.27	.36	.39	.34	.37
N	246	334	332	342	328	224

APPENDIX VII

PERU
DESCRIPTIVE STATISTICS

Variables	4th Grade M	4th Grade F	6th Grade M	6th Grade F	12th Grade M	12th Grade F
116	12.27	12.60	13.14	14.21	16.35	16.03
	(5.63)	(5.94)	(5.68)	(6.17)	(4.95)	(5.56)
	.46	.47	.43	.43	.30	.34
117	11.36	10.37	12.56	12.60	12.04	10.26
	(4.84)	(4.59)	(4.61)	(4.59)	(4.88)	(3.89)
	.42	.44	.37	.36	.40	.38
036	4.14	3.83	4.32	4.25	4.95	4.42
	(2.06)	(2.31)	(2.29)	(2.25)	(2.43)	(2.35)
	.50	.60	.53		.49	.53
047	5.49	4.73	5.05	4.83	4.36	4.01
	(1.23)	(1.66)	(1.37)	(1.60)	(1.56)	(1.46)
	.22	.35	.27	.33	.36	.36
051	2.92	2.92	2.87	3.22	3.32	3.49
	(0.92)	(1.02)	(0.99)	(0.84)	(0.68)	(0.67)
	.32	.35	.34	.26	.20	.19
071	2.54	2.69	2.64	2.86	2.11	2.77
	(0.59)	(0.54)	(0.58)	(0.39)	(0.52)	(0.46)
	.23	.20	.22	.14	.25	.17
178	25.86	16.43	24.66	17.64	27.54	23.35
	(22.75)	(8.74)	(19.63)	(14.45)	(21.84)	(14.95)
	.88	.53	.80	.82	.79	.64
228	...	...	...	...	...	...
	...	...	...	...	...	...
260	2.55	2.42	2.26	2.47	2.19	2.45
	(0.50)	(0.50)	(0.66)	(0.50)	(0.39)	(0.50)
	.20	.21	.29	.20	.18	.20
387	5.38	5.89	5.56	6.35	7.62	7.33
	(0.92)	(1.28)	(1.13)	(1.49)	(0.49)	(0.47)
	.17	.22	.20	.23	.06	.06
405	16.11	11.05	14.61	9.62	9.90	8.25
	(8.66)	(7.36)	(11.06)	(5.61)	(7.68)	(5.11)
	.54	.67	.76	.58	.77	.62
413	25.64	27.86	24.95	22.91	23.48	19.94
	(5.25)	(3.34)	(7.55)	(8.77)	(1.36)	(5.19)
	.20	.12	.30	.38	.06	.26
434	1.93	1.58	1.92	2.16	1.50	1.99
	(0.81)	(0.59)	(0.65)	(0.41)	(0.53)	(0.62)
	.42	.37	.34	.19	.35	.31
N	138	132	152	141	84	124

FOOTNOTES

[1]ECIEL is the Spanish acronym for Estudios Conjuntos de Integracion Economica Latinamericama, Joint Studies on Latin American Economic Integration.

[2]A codebook describing each of the variables has been prepared by the Department of Education of The World Bank. A copy can be obtained through the author of this paper.

[3]This is easily demonstrated by considering the properties of a binomial distribution.

[4]For a demonstration of this result, see Taubman and Wales (1975).

[5]Note that motivation to study harder to achieve more academically is not necessarily the same as motivation to stay in school.'

[6]Something very similar is being carried out in Chile by a group of investigators. See in this regard, Filp, Donoso, Cardemil, Dieguez, Torres and Schiefelbein (1981).

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